TELEPHONE ENGINEER

Volume XVIII CHICAGO, SEPTEMBER, 1912

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Increasing Cost of Operation

In Between
The Telephone Company
It's Profits Dwindling

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has solved this problem for others
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Samples free

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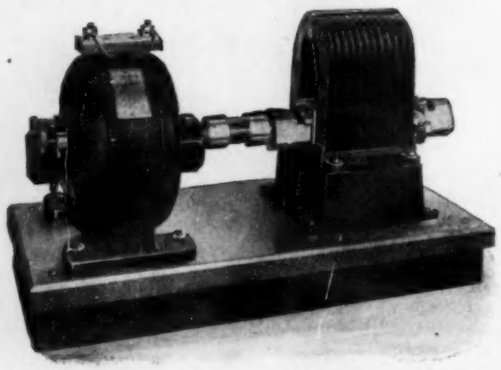
And Ring Your Subscribers Without Batteries
You will find it a BETTER WAY



To begin with, war has sky-rocketed the price of batteries.
Then again, run-down batteries are the source of many troubles:
Operators complain that then "can't raise subscribers."
Subscribers complain about "poor service."
The manager spends much time tinkering with the worn-out batteries, and perhaps travels many miles to locate probable trouble in the phone itself—all to no purpose.

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VOL. XVIII CHICAGO, SEPTEMBER, 1917 No. 3

Scatter the Peak Load

IT always surprises the layman, however extensive his personal use of the telephone, to learn that the peak load of telephone traffic is so definite a thing, and so regular in its habits. A little thought, of course, shows him that it must be so on the law of averages; and that if it were not so, service would cost much more than it does. If the telephone company was unable to tell just when the traffic peak would come on any day, it would have to maintain its maximum operating force continuously, just to meet sudden demands.

So we have no argument with nature's law that makes all days alike in the net result of their activities. The fact that the peak load of telephone traffic comes at the same hour every day is natural. But the fact that there is a peak load at all is artificial and undesirable.

Of course every community has its own peak hour, and they vary as the habits of life vary from one place to another. Big cities reach the height of their demand on telephone service generally about half past ten in the morning. The small towns, where business opens earlier in the day, probably strike the top of the traffic curve a little sooner. The residence exchanges find a considerable peak some time before eight in the evening. And then there is a secondary business peak around two o'clock every afternoon.

Since the average telephone user, as we said before, is unaware of the existence of a peak load and therefore does not know the part he plays in making it, the task of taking the top off the peak and filling up the valleys is somewhat hampered.

However, it can be done. Moreover, it should be done. It is one of the steps toward conservation of labor and equipment that are now forced upon the good telephone man by both patriotism and self interest. A level traffic curve would be an efficiency gain. Under the doctrine of serving the public first, and with the demonstration that the public did not want a level traffic curve, there was no incentive to change the habits of telephone users. Now there is incentive of the highest order.

Advertising—meaning in the broad sense all kinds of publicity—is the only method of accomplishing the task; but its success is unquestionable. The constant repetition of a message urging certain hours for better service is certain to produce its result, and take the sharp point off the peak. Keep asking the people to avoid the telephone rush hour and in time they will do it. Pick out the valley points in the curve and tell them why those are the best hours for telephoning.

This kind of advertising will not reach all the telephone users nor convince all of them it does reach. But you do not want it to reach all of them. You do not want to make a valley out of the peak, but merely to amputate the precipitate and inaccessible crags—to grade the day's curve to as near a level as possible.

Before present conditions end, a lot of things must be and will be done that might hitherto have been thought impracticable. Levelling the traffic curve is one of them. There is no good reason—at this time, especially—why the public should be humored in its tendency to do all its telephoning at certain hours. The correction can be made now with better grace than at any other time.

Out of the trials of present emergency will come a good many permanent benefits to the efficiency of telephone service. The reforms enforced by stern necessity will have their influence upon standard practice in the years to follow. Ultimately a better service and a lower cost will come out of the new economy.

Promotion of Employees

WITHOUT desiring to benefit by the absence of their fellows who have responded to the nation's duty call, those workers who are left behind are certain, in many cases, literally to be forced into opportunity's embrace. A shortage of labor, from whatsoever cause, is as helpful to the employee as it is embarrassing to the employer.

The telephone business has lost temporarily more than its share of skilled workers, because of the Army Signal Corps' demand for experienced wiremen. Yet in spite of their absence, and the difficulty if not impossibility of replacing them while the shortage is universal, service must go on—and probably increase. As the demands on the individual employee grow greater, the standards required for promotion to places of increased responsibility are apt to be lowered. It will be easier to step into the next higher position because there will be less competition for it.

Qualifications that merit selection for promotion are generally so apparent to the employer that little study is necessary. The usual system of promoting for the obvious reasons without attempting to analyze the hidden abilities of the more reticent employees, may not be theoretically efficient, but ordinarily it is practically effective, which is the main consideration. But when the number of available candidates for any job is reduced, and the ability of those who are available is in question, closer knowledge of employees' qualifications becomes necessary.

Governments, federal, state and municipal, solve the difficulty by the system of examining candidates for proof of the knowledge, experience, judgment and ability they claim. Civil service methods are familiar to everyone; but for some reason industry has not heretofore found use for the employment system of government.

The newly adopted plan of the Pacific Telephone and Telegraph Company, to promote its employees by examination, therefore has the interest of novelty, at least in the telephone operating business. Whether the same procedure is to be followed by other Bell companies we have not been informed. The announcement of the company says:

> This plan provides for a detailed practical examination to be conducted under the direction of district superintendents and wire chiefs.
>
> Employees engaged in the mechanical and electrical departments of the company are eligible who can show service of one year. Salaries will be paid applicants during examination periods and cost of transportation will be allowed to and from examination points. Wages and standing of applicants not passing examinations for higher positions will not be affected, and liberal privileges for re-examination are provided for.
>
> In general the examinations will be directed to ascertain the ability of the applicant, his familiarity with other lines of telephone work, his knowledge of safety-first measures and his knowledge of public regulations applicable to construction in his particular territory, with a complete knowledge of the applicant's personal responsibilities.
>
> We are as eager to obtain competent men for responsible positions as the men are to go ahead and we have adopted this plan in order to place promotions on a fair basis.
>
> Increased personal efficiency means success of the entire company operation, and many of the employees are already coming forward for examination.

If managed with interest and spirit, and not allowed to accumulate the dust of civil service, the system should develop a means of selection far more scientific than the method of plain, unassisted judgment.

The Mergers Go On

WAR or peace, hard times or good, whether there be too little or too much labor and material, the mergers go on. Law, patriotism and the fraternal relations of association membership have all failed to stop them.

The only thing that would be pretty sure to end the merger mania would be government ownership of toll lines and local ownership of local systems. But it's a pretty dangerous cure and it might prove worse than the disease.

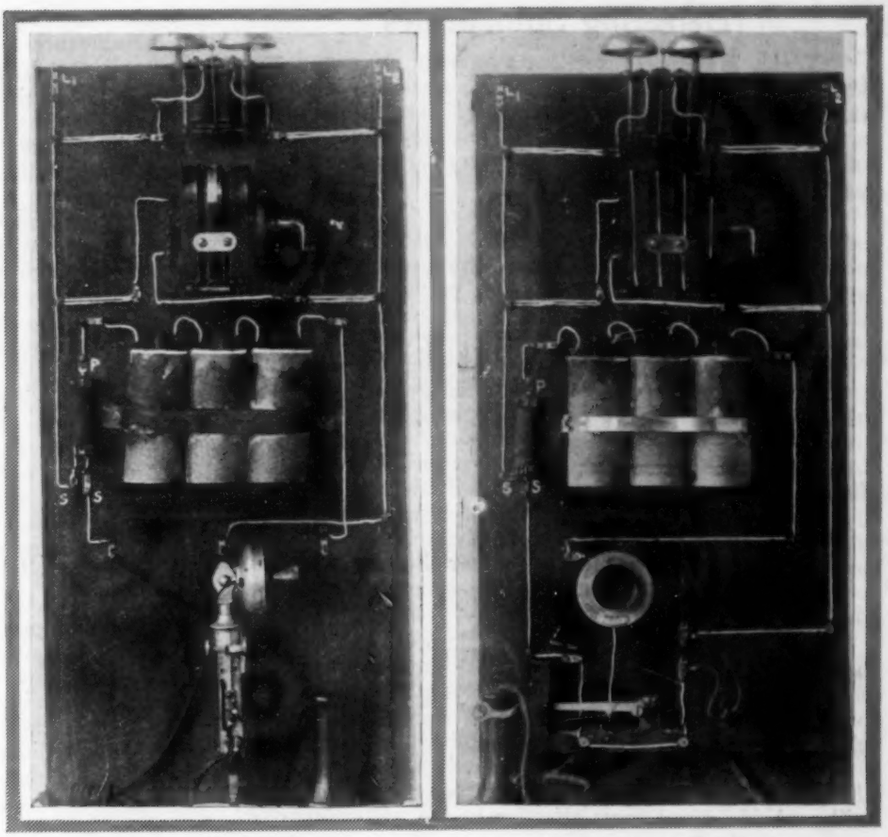
Fixing an emergency telephone-post just behind the firing-line: An incident on the Canadian front. Official photographs. Canadian war records.—From the Illustrated War News.

Sub-set wiring shown in simple form for the benefit of beginners in telephone work is the subject of the four views at the right.

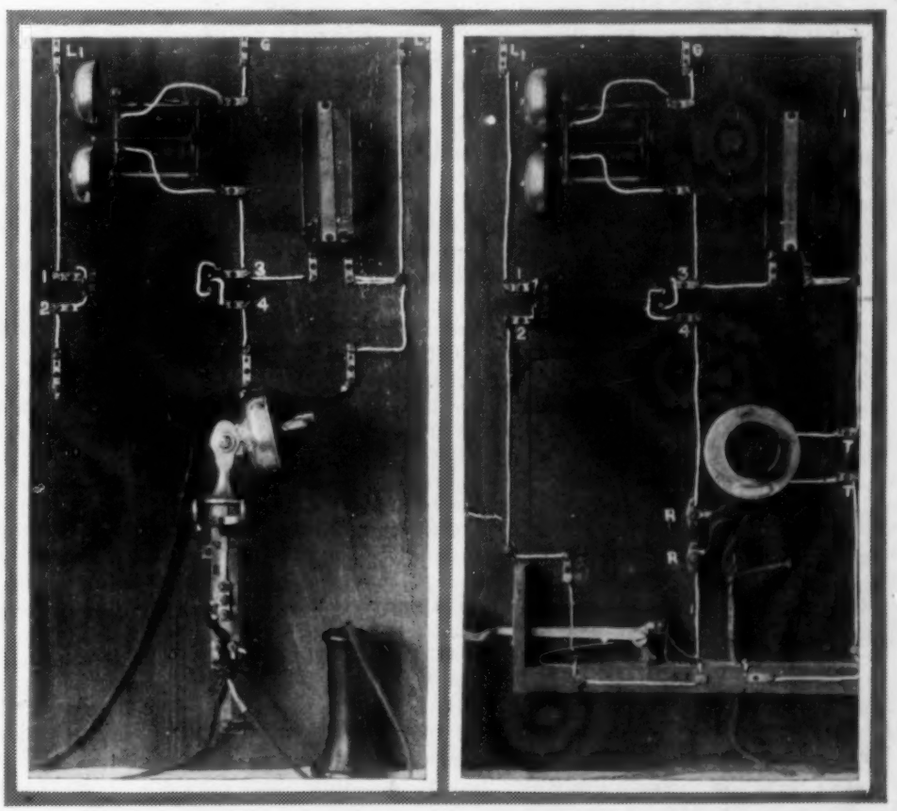
The best way to impress the simplicity of these circuits is to take all of the apparatus required for a sub-set, mount it on a board and wire it in accordance with one of these simplified diagrams; or better still, to mount the apparatus, wire it to screw terminals and give the beginner the job of wiring the set in accordance with the diagram and of connecting it to a line for talking and operating purposes.

The illustrations here given are those of wiring boards that were used in the general training course to impress the wiring of common battery and magneto desk and wall sets in the minds of men just entering into telephone work. — Southern Telephone News.

Photographs from the Russian front are particularly interesting just now, in view of the recent declaration of the new Provisional Government that its most important task will be "the development of the principles of democratization in the army and the development of its military power, both offensive and defensive." This is a Russian listening-post below a German position: Two officers on duty—one (on the left) with a case containing his gas-mask.—From the Illustrated London News.



Magneto Desk Set *Magneto Wall Set*



Common Battery Desk Set *Common Battery Wall Set*

STORIES IN PICTURES OF TELEPHONE PRACTICE AND PROGRESS IN ALL PARTS OF THE WORLD.

Detecting Submarines

Water is a most excellent conductor of sound and lends itself nicely to sound detecting systems. The fact that there are no so-called zones of silence in the water and that it is a homogeneous medium permits of the use of sound-detecting system with every advantage at the outset.

It is understood that much is being done in the way of employing megaphones for the detection of submarines, and some of these systems have already reached a remarkable state of development, permitting not only the presence of a U-boat to be detected, but also its exact position so that the range can be given to a gun crew. It is well to add here that the original microphone system employed by the Entente powers some time ago operated quite satisfactorily, according to reports, until the Germans saw fit to mount their motors on sound-absorbing bases, thus making their submarines practically silent and foiling the megaphone ears of the British and French land stations. However, the latest systems of microphonic detection do not rely upon the submarine's hum, hence it is of no consequence whether the German craft are noiseless or noisy, running at top speed or resting on the bottom.

A most promising system of microphonic detection has been developed by a New York inventor, and although the general details were disclosed and a drawing prepared showing the main parts of the apparatus employed, it was deemed best not to publish it at the present moment for obvious reasons. But it is well to add here that the microphone system in a highly developed form will probably prove most effective in the anti-submarine campaign.

Another phase of the submarine problem is the protection of harbors against submarine attack. Heretofore huge nets and contact mines have been considered ample defense against the underwater enemy; but it has been demonstrated on at least one occasion during the present war that a submarine, piloted by a skilled navigator, can worm its way through a mine field and the heaviest of nets and reach shipping riding at anchor in what has been considered a safe berth. Furthermore, it is reported that the latest German U-boats are provided with a cutting device on the prow which permits them to cut their way through the heaviest net; hence the latter are no longer dependable.

How to protect harbors against submarine raids has been closely studied by Edward F. Chandler of New York city, whose various military inventions have been described. In the present instance Mr. Chandler proposes using electrically-fired mines which are equipped with microphones; in other words, mines that can "hear" the enemy and report their findings to a central point. Thus his system of mining a harbor possesses the advantage of the electrically-fired mine field in that each unit is not destructive until it is made so by pressing a firing key, and in no event is there the danger ever-present with the contact mine which does not distinguish between friend and foe. Again, his system has the advantages of the contact mine field inasmuch that the enemy courts destruction the moment he enters a mine field, no matter how carefully he may strive to avoid detection.

Mr. Chandler equips his electrically-controlled mines with microphones, which are capable of detecting sound waves traveling through the water and of indicating the presence and strength of these sound waves at a central station. The mines are arranged in geometrical order, each mine forming a corner of a square in such a manner that the entrance to a given harbor is divided into many squares—a sort of checker-board, as it were.

As a submarine enters Mr. Chandler's mine field it indicates its presence by the sound it creates. The hum of the motors and the beating of the propeller are picked up by the microphone in the mines nearest the submarine, causing a certain square of a checkerboard indicator to flash up at the central station. This indicates to the operator the square in which the submarine happens to be at that moment; and in this manner the operator is able to follow the course of the submarine as it worms its way through the mine field by closely watching the different squares of the luminous indicator flare up and die out one by one.

Now, then, since the mines are spaced a considerable distance apart, it would be obviously impractical for the operator to explode the four mines forming the corners of the square in which the submarine happens to be. To this end Mr. Chandler has introduced what he chooses to term a "precision indicator," which is a sensitive form of electrical indicator which makes it possible to determine what mine the submarine is nearest to at any given moment.

After the operator has followed the progress of the submarine on the luminous indicator board and has decided to explode a mine, he switches the precision indicator in circuit with each of the four mines of the square indicated. As each mine is momentarily connected with the precision indicator a reading is obtained, this readi indicating to what extent each microphone is being affected, which in turn indicates the close proximity of the submarine.

It is a simple matter, according to Mr. Chandler, to determine upon the mine nearest the submarine, which is then exploded. Inasmuch as a 500-pound mine exploding 50 feet away from a submarine has a destructive effect sufficient to destroy a submarine or at least put it out of action, it is evident that the submarine has a poor fighting chance once its location is revealed by the eavesdropping mines. Incidentally, Mr. Chandler's system can be used as a protection against surface craft of all kinds, the operation being the same. In this manner it becomes impossible for surface ships to dash past an electrically-controlled mine field during fog or at night.

Big Men in Signal Corps

The Signal Corps, more than any other branch of the army, has drawn to it men of national reputation, leaders in their fields.

Among the majors are John J. Carty, chief engineer of the American Telephone and Telegraph Company, widely regarded as the foremost telephone engineer of the world; Frank B. Jewett, chief engineer of the Western Electric Company; George M. Yorke, vice president of the Western Union Telegraph Company; Charles P. Bruch, vice president of the Postal Telegraph Company; Charles R. Forbes, superintendent of public works of the Territory of Hawaii, and Hiram Bingham, member of the Yale faculty, noted explorer, historian and educator.

Among the captains are: Louis R. Krumm, chief radio inspector of the Department of Commerce; Sosthenese Behn, president of the Porto Rico General Telephone Company; Terry W. Allen, of the Allen Properties, Nashville, Tenn.; Garrison Babcock and John A. Kick, of Chicago, and many others well known in the telephone field.

Construction Material and Pole Line Hardware

Standardization Committee Report of the Kansas Independent Telephone Association

By H. N. FARIS, Chairman.
J. H. CLOSE,
A. J. ROBERTS, and
J. R. SHIPLEY.

THE crying need of standardization in Independent telephone construction methods has long been recognized, but no concerted action has been taken for the reason that the several jobbers and supply houses have until recently been able to get almost anything their individual customers might select from the large number of non-standard items catalogued and therefore supposed to be available.

Jobbers have had to make their orders on the manufacturers call for a little of this and a few of that, whereas they should have been able to purchase in large quantities and thereby be able to secure and give lower prices.

As no jobber cared to criticise the selections of his patrons this condition might have gone on indefinitely had the issue not been forced by the scarcity of raw materials and consequent shortages in stock which came upon the country about a year ago.

At the Annual Convention of the Kansas Independent Telephone Association held in Topeka in December, 1916, H. N. Faris, who was later made chairman of this committee, read a paper on the subject of construction in which he called attention to the large load of superfluous items being carried for the Independent trade and illustrated with a table full of samples why many items should be obsoleted and just what could and should be used in their places.

Mr. Faris' paper proved conclusively that many of the construction materials in current use never had been designed for telephone service but had merely been adopted because available at the birth of the industry and were still in use not because suitable but purely as a result of too close adherence to "The calf path of precedent." In other words, the telephone companies have continued to order these items because they were catalogued and the jobbers have continued to catalog them because they were ordered.

As an example of this was cited the time honored 1¼"x8" telephone pin with the shoulder in the middle. This pin has continued the Independent standard for more than twenty years notwithstanding it does not fit either of the two cross arms of Independent practice, being ¼" too long below the shoulder for the 3¾" "telephone" arm and ¼" too short for the 4¼" "long-distance" arm. Millions of these hard wood pins have had the extra quarter inch sawed off at enormous labor expense, while thousands of miles of Independent toll lines are equipped with pins which lack a quarter of an inch of reaching through the arm.

Before adjournment the association voted the appointment of a committee of practical construction and supply men to investigate the entire material proposition and submit to the association this report.

In view of present conditions it has not been considered advisable to demand from the manufacturers any new sizes or designs at this time, but attention has been called in two or three instances where slight changes are needed, so that manufacturers can arrange to comply with such suggestions as soon as they can conveniently do so. For the most part this report is merely a recommendation as to what sizes and styles of materials are most suitable for Independent construction, and why.

By confining their purchases to the items recommended herein Independent companies can secure better and more durable construction, carry more extensive stocks, with a minimum of tied up capital, secure better and more efficient service from their suppliers and render the same to their customers, and in the long run save money.

For the reader's convenience and to permit of proper discussion under each general heading this report has not been arranged in strict alphabetical order but by subjects. Thus all related materials and those likely to be needed for a certain piece of work will be found grouped together, as, for example, the listing of machine bolts, carriage bolts, cross arm braces and lag screws under the general heading of "Pole Line Hardware."

POLES

The only poles to be considered in this section for new and permanent work, are Northern White Cedar, Mountain Red Cedar and Southern Red Cedar, the latter being limited to rural line construction.

Northern White Cedar is already standard and should be retained as such. It should be purchased under Northwestern Cedarmen's specifications for general use but should be purchased under more rigid specifications when intended for use in rebuilding city exchanges.

Mountain Red Cedar being perfectly straight, is well adapted for the rebuilding of city exchanges, but as these poles have very little taper, nothing smaller than 8 inch tops should be considered for exchange use and even heavier tops are advisable for important corners. In general, Mountain Cedar should be ordered with two inch larger tops than Northern Cedar.

Southern Red Cedar is extremely durable but so rough and unsightly that its use should be limited to the construction of unimportant rural lines. Southern Cedar is recommended, when obtainable, where it is considered necessary to use poles less than 20 feet in length. But for 20 feet and over Northern Cedar is recommended, except that Mountain Red Cedar may be used in exchange reconstruction, as above cited.

Treatment of Poles

This is without doubt one of the most important subjects to the Independent companies of this section which has such climatic extremes of cold and hot, wet and dry, as to render pole treatment most advantageous, and, considering the great increase in life which can be had from proper treatment, the setting of untreated poles is absolutely wrong from an economic standpoint and is wholly inexcusable in view of the fact that the cost of a thorough and effective treatment is now much less than formerly.

The Committee recommends the use of "Barrett's Carbosota Grade One Liquid Creosote Oil," or its equivalent as per government reports available on other oils of like nature.

Brush treatments are recommended only for new existing lines set untreated, and when for any reason the poured treatment herein recommended cannot be used. Brush treatments are also valuable for touching up defects in poured treatment due to abrasions in handling between pole yard and line. Neither are the more expensive tank treatments recommended for the average Independent company. Anyone, however, can heat up a quantity of preservative in his pole yard in an old iron kettle or similar container, and pour the hot oil over the pole butts, catching the drippings in a shallow pan so they can be re-heated. The saving in labor costs by this method is almost sufficient to pay for the extra quantity of oil so used, while there is absolutely no comparison in the efficiency of results. The pouring method should be used regardless of whether the entire butt is to be treated or whether the treatment is to be confined to a short distance above and below the neck rot line.

What we recommend is a heavy poured treatment at the neck rot line, giving the pole at this point all the oil it can be made to absorb, while the lower portion, well below the ground line, can be given a lighter treatment, consisting of a single pouring. Be sure to remove all inner bark before attempting treatment.

Pole tops and gains can be treated in the same manner by pouring the hot oil with a large cup or dipper and catching the surplus in an ordinary pail.

ARMS, PINS AND BRACKETS

Cross Arms

Nothing except Washington or Canadian Fir cross arms should be purchased by Middle West companies. Pine arms are a trifle cheaper in some sections, but as a fir arm untreated is probably equal in life to pine arm treated, the pine arm should be eliminated and since the life of the fir arm can be greatly prolonged by treatment, it is hoped that Independent companies will adopt the practice of treating fir arms by the methods recommended herein.

We also recommend the elimination of 2-pin cross arms from telephone work. It is recommended that what is now known as the "Telephone" cross arm, 2¾"x3¾", bored for attaching with center bolt and also bored for 1¼ pins with spacings of 16 inches at the pole, 10 inches on sides and 3 inches on ends and with borings for 2 brace bolts 28 inches apart, be retained as standard for exchange work and rural lines. This gives "Telephone" cross arms in the following sizes:

42-inch 4 pin, 62-inch 6 pin,
82-inch 8 pin, and 102-inch 10 pin.

We believe the 12 pin arm in this size should be eliminated, due to the fact that arms of this small cross section should not be used in lengths longer than 8½ feet.

For long distance lines, and heavy rural construction, many companies prefer the heavier 3¼"x4¼" cross arm, with spacings of 16-inch center, 12-inch sides and 4-inch ends, which gives "Long distance" arms in the following sizes:

6-foot 6 pin 10-foot 10 pin.

This heavier arm was formerly designated by the term "Standard," but as the lighter "Telephone" arm is used on more than 90 per cent of all Independent lines, the term "Standard" for the heavier arm has become a misnomer and should never be used, for when you order "10-pin standard arms" your jobber is always in doubt whether you mean the real 10-foot heavy arm, formerly known as standard, or the 8½-foot 10-pin telephone arm, which although never designated as standard, has really become the standard for Independent work. We therefore recommend that all companies acquire the habit of referring to the lighter arm as the "Telephone" arm and to the heavier arm as the "Long distance" arm. Or better yet, acquire the habit of referring to 62-inch 6-pin arms for the "Telephone" size and 6-ft. 6-pin arms for the "Long distance," as it is thoroughly understood that the greater cross sectional dimensions go with the longer arm.

The heavier, or "Long distance" arms, were formerly bored for 1½" oak pins but since it has been discovered that 1¼" locust pins are much stronger and more durable than the 1½" oak pins, it is customary to specify that long distance arms be bored for 1¼" pins, center bolt for attaching and for 2 brace bolts, 34 inches apart, for 26-inch braces. This boring and the 26" brace is recommended notwithstanding the fact that "Long distance" arms are regularly bored with 2 brace bolt holes 42" apart for 30" braces. We believe that for any work, except long toll lines using extremely heavy wire, the 1 7/32x7/32x26" brace will be found fully as serviceable as the 1¼x¼x30" brace which costs about 40 per cent more.

On account of their being used for electric light and telegraph work, in addition to telephone lines, "Long distance" arms are usually carried in blank and bored to order for the telephone trade. It is therefore advisable that all Independent companies using this heavier "Long distance" arm confine themselves to the standard borings, above recommended, so that jobbers will be justified in carrying stocks of these arms with such bornings.

Special Telephone Arms

The fact that regular 2¾"x3¾" "Telephone" arms are too light for corners and dead ends, and, in the opinion of many first class telephone men, are too light for any ten pin leads with No. 12 wire, makes it advisable to use arms with greater cross section for these purposes.

Manufacturers have accordingly arranged to furnish the 3¼"x4¼" ten pin arms in Telephone length and we cannot recommend their use too highly for corners, dead ends and heavy ten pin leads in general. Being the same 8¼-ft. length as regular Telephone arms they can be used on corners without destroying the neat and uniform appearance of the lead even though its straight away portion be equipped with the lighter regular Telephone arms.

We further recommend that these "Special telephone" arms be used in the ten pin length only as the larger companies are dispensing with 8 pin arms altogether and are using the Telephone size exclusively for 4 and 6 pin and the heavier "Telephone special" or "Long distance" arms for ten pin.

Realizing the importance of strong corners and the high labor cost of making any changes at corners, we recommend the placing of ten pin "Special telephone" arms at corners even on 6 pin leads where there is the slightest possibility of the lead's exceeding 6 wires later on. The "Special telephone" arms should be bored for 1¼" pins and provided with 2 brace bolt holes 34" apart. Either 1¼x7½" or 1¼x8" pins should be used, and, in either case, the pin should measure 4¼" below the shoulder.

We recommend the 1¼x8" pins with double groove insulators and placing the wire in the lower groove on corners and dead ends. The 8" pin will, if necessary, take a "Long Distance Regular" insulator while the 7½" pin will not.

Treatment of Cross Arms

While the majority of Independent companies have already adopted the practice of treating poles, very few of them realize that equal advantages are to be derived from the treatment of cross arms, which is a very inexpensive and necessary procedure if maximum life is to be gotten from the arms.

For proper results, heat the oil in the dripping pan recommended for poured treatment of pole butts. Don't get the oil hotter than 150 degrees Fahr. as overheated oil may make the arms brittle. The treatment of arms in this manner is rapid and convenient, involving very little expense and using a comparatively small quantity of oil. Arms must be thoroughly dry at time of treatment. If they are exposed to sun and wind for a few days after treatment they will not be disagreeable to handle, although gloves should of course be worn at all times when handling either freshly treated arms or poles.

For best results arms should be pinned up before being treated. The taper of the pin allows the hot oil to enter perfectly and when arms are treated before being pinned it is frequently found almost impossible to insert either treated or untreated pins.

Pins

Oak pins have perhaps caused more maintenance expense to Independent companies in proportion to the slight saving under the cost of locust pins than any other construction material item.

While there is some tendency during the present high price of locust, to return to creosoted oak or elm pins, the committee hopes that all Independents will stand out steadfastly for locust or hedge pins, as the present demand for locust in ship-building work is perhaps only temporary and a good grade of locust pins at a reasonable price should later become available.

Again do we find in the Independent telephone pin situation a great need for further standardization. Independent telephone companies have always used in connection with telephone arms, 1¼" pins which project through the arm ¼", and, in consequence of the construction man's desire for good workmanship, are usually cut off at a heavy labor and tool expense, for, after working on hard wood pins for a short time, a saw usually requires re-filing. The ordinary 8" pin is also too long above the cross arm to afford strong and sturdy construction with telephone insulators and it has therefore been proposed to the manufacturers that they develop a 1¼x7-inch "New standard telephone pin" measuring 3¼" below the shoulder and 3¼" above the shoulder, which pin we hope to see telephone companies insist upon until the manufacturers regularly stock it at their branch warehouses, thereby making it available to the smaller jobber as well as to the carload lot purchaser.

The present 1¼x8" pin is equally unsuitable for use in the heavier long distance arm, because in this case it lacks ¼ inch of reaching through, so that the committee recommends that the present 8-inch pin be shortened ¼" above the shoulder and lengthened ¼" below the shoulder so that such 8-inch pin may become the standard for "Long distance" and "Telephone special" arms, just as we have recommended the 1¼x7" pin as standard for the "Telephone" arm.

Both pins will then fit their respective arms without sawing off and will take any insulator that has ever been used in noticeable quantities by telephone companies. The proposed 1¼x8" pin will also take the so called "Long distance regular" insulator which has long been used by the Bell companies in connection with "Long distance" arms and 1¼x9" pins.

The committee unhesitatingly recommends the 1¼x8" pin as more suitable for Independent companies who will seldom use the Long distance regular insulator and even when the latter insulator is used, the 1¼x8" pin will be found more sturdy than

the 9-inch, while no one will be able to measure or detect any decrease in insulation resistance.

Until such time as their jobbers can supply the standards herein recommended, telephone companies will have to continue sawing off 1¼x8" pins, for telephone arms, but should purchase 1¼x9" pins for Long distance arms, instead of the 1¼x8", which has been frequently used, heretofore, notwithstanding the fact that it reaches only part way through the cross arm.

The former practice of ordering special 1¼x9" transposition pins and special transposition insulators is rapidly giving way to the more sensible practice of using a regular insulator on the regular pin and a second regular insulator on a galvanized one point transposition bracket which bolts to the arm so as to place the second insulator below the arm and directly under the first insulator.

The committee recommends the use of galvanized brackets for all transportation work and that jobbers be relieved of carrying the special and extremely expensive transposition pins and insulators. This makes it possible to pin and glass the arms regular and let the transposition gang attach the transportation brackets where needed. Future trouble and maintenance expense is thereby avoided and the line talks better by not bringing the two sides of the circuit so close together as is necessary when they are to tie on to the same transposition insulator. Nothing but "running transpositions" should be considered as the secret of avoiding "cut-outs" is to keep all joints in any line under strain.

Oak Brackets

The poor and flimsy quality of the oak brackets now in service on most Independent lines proves the need of the adoption and enforcement of proper standards by the telephone industry itself.

Realizing the poor quality of the smaller brackets, most of the larger companies have for several years past been using the 12-inch Western Union Telegraph bracket, but even this bracket is not wholly suitable for telephone work, due to the fact that the wood has been cut away at the top to take the long 5-inch Western Union insulator, which is never used by telephone companies. When a small telephone insulator is screwed onto the tip of this Western Union bracket a tremendous strain falls on the smaller end nail hole so that even these heavy Western Union brackets are frequently split out when subjected to unbalanced strain. The committee has brought this matter to the attention of the jobbers and manufacturers and requests that each telephone company make their jobber acquainted with the demand and crying need of pins and brackets designed to take insulators no larger than those regularly used by telephone companies.

In other words, there is no reason why a telephone company should be required to use either brackets or pins with thread designed to take the large insulator of electric light and telegraph practice.

Of course pins and brackets suitable for telephone work are already available for the larger jobbers who can order in carload lots direct from the mills, but pressure should be brought to bear on the manufacturers who make a specialty of warehousing for the benefit of the smaller jobbers so that the latter can furnish suitable material to their telephone trade.

Of course the jobber would much prefer to have the telephone companies content themselves with the style of brackets and pins required by the electric light companies and it is up to the telephone companies to persistently demand stocky brackets and pins suitable for telephone work, and until such brackets are obtainable from your jobber, we can only recommend the continued use of the Western Union bracket which, although not designed for telephone insulators, is the only bracket sturdy enough to afford safe and durable construction.

Treatment of Brackets and Pins

While locust pins of the best quality will endure for a long time untreated, they take up so little oil as to render treatment a very inexpensive proposition. When arms are treated the pins should be inserted dry and treated with the arms as the pin taper allows proper penetration.

Oak brackets should always be purchased unpainted and should receive a poured or dipped treatment before being used. Oak brackets are very rarely cut out of seasoned wood and as the jobber's basement or warehouse does not always supply the best facilities for seasoning, it will pay well to purchase oak brackets in advance and allow same to become somewhat seasoned before treatment is applied. If an oak bracket receives a poured or dipped treatment of hot oil before it is used, its life and strength will be brought up to that of a butt treated pole, whereas at the present time there are too many lines in service where even untreated poles have actually outlived the oak brackets and the treatments recommended for both pins and brackets are so easy and inexpensive to apply that there is no reason why they should not be more generally used.

BATTERIES AND BATTERY MATERIALS

Dry Batteries

The 50 per cent increase in cost during the past two years together with lack of improvement in quality of materials available, makes the dry battery expense one of the most serious propositions which magneto exchanges have to face at the present time.

No recommendations can be made in regard to the make of cells which should be purchased. But we do believe the demand for extremely high amperage batteries from so many of the smaller telephone companies has cost the Independent industry a handsome sum of money during the past ten years.

Eighteen years ago dry batteries that would give more than 12 amperes on short circuits were comparatively unknown and old timers will recall that, even with the low resistance transmitters of those days, it was no uncommon occurrence to get a longer life out of a pair of dry cells than is commonly heard of at the present time when higher amperage batteries are the general rule.

It was not long after dry batteries first appeared on the market until several rival makes were contending for supremacy. Unfortunately about this time ammeters became very inexpensive and popular, and, as the average telephone man was inclined to connect higher amperage with superior quality, there was nothing for each maker to do but bring up the amperage of his cells a notch at a time until the practical limit for a 2½x6 dry cell had been reached.

Connected with the temptation to increase amperage in order to make the product more salable the manufacturer had another incentive which was the avoidance of complaints, for, in general, high amperage short life batteries are less likely to eat through the cans at the end of their life than are low amperage long life batteries. This is due to the fact that the easiest way to increase the initial amperage of a battery is to reduce the thickness of the electrolyte wall by using a thinner absorbent paper which will of course contain a smaller amount of electrolyte.

The experience of manufacturers and jobbers alike proves conclusively that the average telephone man will use a dry cell for two years and complain vehemently if at the end of that time the zinc can be eaten through, and the same telephone man will register no complaint on removing another pair of batteries after 15 months of service if he finds the zinc can to be intact.

Thus in improperly demanding high amperage batteries and in demanding batteries which would not eat through toward the end of their life the telephone companies have greatly increased their battery expense.

During the past two years there has been a great shortage of sheet zinc and many battery manufacturers have had to use such zinc as they could obtain regardless as to whether it was under or over standard gauge, but so far as the committee can learn, the difficulty of getting standard gauge zinc is not as acute as formerly and while not presuming to recommend any particular make of dry cells, we do suggest that preference be given to the manufacturers who recognize that telephone batteries are never called upon to deliver heavy amperages and that all other things being equal and the performance being satisfactory, preference be given to the manufacturer whose battery contains the greatest amount of electrolyte and the heaviest weight of zinc can, which two conditions any telephone company can readily determine by dissecting one or two cells out of each barrel received, and we believe such expense to be justified as a check on the manufacturers and to enable the telephone company to have information of any radical change which may be made in the construction of any particular make of cell.

It should also be borne in mind that low amperage is not in itself an indication of high quality, as low amperage can result from the batteries having been in storage too long a time. Neither is an amperage as high as 18 or 20 an indication of inferior quality, provided such high amperage is the result of superior materials and superior mechanical construction in the cell and is not the result of cutting down the thickness of the electrolyte wall and the consequent reduction in the amount of electrolyte used.

Any make of cells with a definite thickness of electrolyte wall should show up fairly uniform in amperage at the same temperature, and serious lack of uniformity in batteries received in the same barrel may be taken as an indication of defects.

In case a barrel of batteries be suspected of being defective a few of the cells should not be used until it has been found that batteries placed in service develop no early trouble.

It is almost impossible for a manufacturer to tell anything about batteries after they have been placed in service, but if a certain barrel of batteries be found to give unsatisfactory service and you can return 3 or 4 cells out of the same barrel which have never been used, your jobber will be in much better posi-

tion to put the matter up to the manufacturer and secure a proper adjustment, provided the cells are really found to be defective.

Extremely short life given by dry batteries at many telephones may not be due to poor quality of the batteries. There are hundreds of telephones in service which actually consume more than half an ampere whenever the receiver is off the hook, and when batteries give short life on such telephones the condition is due to excessive current consumption of the transmitter and is no fault of the battery.

The transmitter may be giving very efficient transmission, but if it is doing so at an excessive expenditure of battery, it will be found economy to change such transmitters, particularly if they are on telephones where the receiver is off the hook a great deal of the time, either necessarily or through improper usage of the instrument. Dry battery expense can only be reduced by such diligence on the part of the telephone company to weed out and change transmitters with excessive battery consumption and by a concerted demand for dry cells with heavy zinc cans and ample quantities of electrolyte.

Gravity Batteries

Gravity batteries having advanced more in proportion to their former cost than have dry batteries, it is becoming increasingly popular to equip small boards with battery cut out keys and larger boards with battery contacts on each listening key so that dry batteries may be used, which practice cannot be too strongly commended.

Many companies still using gravity batteries have found it possible to reduce the cost of upkeep on same by using 5x7 size zincs instead of 6x8 size and we believe no observable difference in transmission can be noted, regardless of whether the 6x8 or 5x7 size zincs are used.

Storage Batteries

A great many magneto exchanges finding the dry battery proposition to be a serious one with respect to the dry batteries used in the central office, have installed small storage battery plants to do away with dry batteries altogether inside the central office. The installation of storage batteries and means of charging same from whatever commercial current may be available is too large and special a subject for the scope of this report, but we recommend that any large magneto exchanges not contemplating a change to common battery at an early date, give proper attention to this subject and confer with their manufacturer or supply house relative to the possibility of installing a small storage battery outfit and getting away from all dry battery expense within the central office.

HOT GALVANIZED POLE LINE HARDWARE

Anchors

Anchors for telephone use must be divided into two classes: "Patent" anchors and the old-fashioned "dead-men" or wooden logs. Until a few years ago all old time construction men were inclined to be doubtful as regarded the real utility of the patent anchor and were inclined to incur unnecessary expense in setting heavy dead-men to take care of ordinary strains where patent anchors might just as well be used. Several of the patent anchors, notably the Ever-Stick, which is designed to be expanded by means of a tamping bar, and the Mathews or Scrulix anchor, which is designed to screw into the earth, have won recognition from large telephone companies who are successfully using them where guys are required against strains not heavy enough to justify the expense of planting heavy dead-men.

This is a matter in which telephone companies must use their own judgment, for it is just as futile to attempt to hold a heavy lead with a small patent anchor as it is foolish to set an elaborate dead-man for the holding of a light and unimportant strain.

The electric light and Independent telephone companies have already found the Matthews type of anchor extremely convenient and suitable for use with light strains and the Bell companies have found the Ever-Stick type of anchor to be capable of withstanding fairly heavy strains on long distance lines, and there has only recently appeared an anchor manufactured in Kansas, known as the "Wilcox" anchor, which is entirely making good in the patent anchor field and which we recommend to your tests and consideration.

There has also appeared on the market a distinct type of patent anchor known as the "Never-Creep," which has come into wide use in power transmission line construction and which is undoubtedly entitled to more consideration for telephone work. These anchors are large in resisting surface and pull wholly against undisturbed earth, as the hole which receives the anchor is bored at right angles to the anchor rod.

The manufacturers of the "Never-Creep" anchor make extremely strong claims for it and declare it is in the "dead-man" class as regards holding power rather than in the class of patent anchors of less area. It is further asserted that the establishing of these claims through field demonstrations accounts for the favor the anchor has met with from large companies for whom the manufacturers could afford to make field demonstrations. The committee recommends that Independent companies take steps to try out this anchor for themselves as regards ease of installation and holding power, for, in proportion to the holding power claimed, it is very reasonable in cost.

The "Never-Creep" anchor requires a special rod, regularly furnished with each anchor, and the sizes recommended for telephone work are as follows:

6½x15 inch with ⅝"x6' galvanzed rods.
8½x20 inch with ⅝"x6' galvanized rods.
8½x30 inch with ¾"x7' galvanized rods.

But in general, as the matter of soils has everything to do with the adaptability of patent anchors, while the old-fashioned dead-man has proven reliable for heavy strains in any soil, we must recommend that each company determine for themselves the adaptability of patent anchors and the maximum size of lead which their men shall be allowed to guy with the size and style of anchor which they decide to adopt. It is recommended that purchases of Ever-Stick anchors be confined to 6 and 8 inch 2-way and to the 10 inch 4-way, and that the purchase of Matthews anchors be confined to 5, 6 and 8 inch sizes in order that telephone jobbers supplying this territory may be enabled to keep stocks of these sizes well replenished.

Anchor Rods

Anchor Rods are required not only for use with "dead-men" but also with patent anchors of the Ever-Stick type and we recommend that the following sizes be adopted as standard: ½ inch x 6 foot, ⅝ inch x 6 foot and ¾ inch x 8 foot.

These rods should be of the full diameter above specified when cut threads are used. But with the rolled up type of thread the stock may be 1/16 inch under size and the thread rolled up on same to take a standard U. S. nut of the size specified.

Tests conducted in the laboratories of several technical institutes show there is little difference in the strength of full sized rods with cut threads and under sized rods with threads rolled up to size.

The smaller rod with the rolled up thread usually shows up slightly stronger, particularly in the larger sizes, and, as it is usually slightly less in cost, independent companies may use both rolled and cut thread rods indiscriminately.

For the reason that small rods are weaker in proportion to their size than large rods we recommend ½ inch as the minimum diameter, while 6 ft. is recommended as a minimum length due to the fact that no anchor should be buried with its eye at the ground due to the greater liability of breakage at the weld.

While a much greater range of sizes has been used in the past and jobbers' stocks and prompt deliveries have been demoralized thereby, we believe that Independent companies will have no difficulty in confining their requirements to the sizes herein recommended, and in cases where extremely heavy anchors are required it will be found that two of the ¾x8 foot anchors can be purchased for considerably less money than can one 1 inch x 10 foot anchor, which we trusut Independent companies will be able to keep away from in the interest and for the advantages of equipment standardization.

Machine Bolts

It is recommended that machine bolts be used for attaching cross arms, cable hangers and J hooks to poles and for securing space blocks between double cross arms.

While it has been customary to attach J hooks by means of two lag screws on each side, this weakens the pole a great deal more than it does to use a ½" or ⅝" machine bolt clear through which holds the J hook in place more firmly and leaves no possibility of the guy creeping down. Smaller size machine bolts may also be used for attaching cross arm braces to cross arms.

There are at the present time no less than fifteen sizes of machine bolts used for attaching arms to poles, and as these bolts are now regularly provided with long threads there is no good reason why the odd lengths should not be abandoned, and we therefore recommend that the following sizes only be ordered for general use:

½x 8", ⅝x 8", ⅝x12"
½x10", ⅝x10", ⅝x14"

When bolts longer than ⅝x14 are needed for double arming purposes, it is recommended that the regular double arming bolts, threaded for nut and washer at each end, be used instead. It will be noticed that ½" machine bolts have been listed in 8" and 10" lengths only, and in our opinion none longer than 10" should be used. In order to secure a long thread without prohibitive cost, it is necessary to roll the thread which, as already mentioned, necessitates the use of stock 1/16" under size so that a ½" bolt is really made from a 7/16" rod, and, as so small a

rod will not roll up to fit a standard nut tightly, the ½" bolt with rolled thread is not entirely satisfactory. We, therefore, recommend ⅝" bolts for attaching all cross arms and by concentrating all purchases on a few sizes of ⅝" bolts, such bolts with their greatly increased strength can be secured at very slight additional cost. None of the larger companies is attempting to attach cross arms with ½" bolts.

Double Arming Bolts

Double arming bolts should be used in the ⅝" size only as the ½" double arming bolts bend too readily to hold the double cross arms in correct position.

For uniformity we recommend the use of double arming bolts in place of machine bolts when machine bolts longer than 14" are required as the few extra nuts so accumulated are sure to come in handy. This will make the regular sizes of double arming bolts as follows:

⅝x12 ⅝x16
⅝x14 ⅝x18

Each double arming bolt is regularly equipped with a long thread at each end and four nuts, but the square washers must be ordered in addition.

We also desire to call attention to the fact that the time honored space block with machine or double arming bolts affords much firmer construction for double cross arming than can be had with double arming bolts with inside nuts, and, as the additional cost of the space block is largely offset by the decreased cost of machine bolts, we recommend that where double arms are to be used for dead ending purposes space blocks be used. On two pole corners double arming bolts are, of course, equally satisfactory.

Carriage Bolts

Carriage bolts should be used only for attaching cross arm braces to cross arms and for bolting through cross arms on important corners to prevent end pins splitting out. ⅜x3½" should be used with regular telephone arms and ⅜x4" with "Long distance" and "Telephone special" arms.

It would undoubtedly be advantageous to abandon carriage bolts altogether for telephone work and use instead steel machine bolts in these same sizes and we recommend that you bring this to the attention of your jobber and urge him to prepare to furnish steel machine bolts instead of carriage bolts in these sizes.

When carriage bolts are used a 1⅛" round washer with $\frac{9}{16}$" hole should be used at the head of the bolt. When machine bolts are used a 1" or 1⅛" round washer with $\frac{7}{16}$" hole should be used.

Cross Arm Braces

The telephone size cross arms are regularly bored for 22" cross arm braces and the committee believes that the 1"x$\frac{3}{8}$"x22" brace can be made standard for all straight-away work with telephone arms. "Long distance" and "Telephone special" arms, as already stated, should be bored for two brace bolts 34" apart, which boring adapts them for use with 1$\frac{3}{32}$"x$\frac{3}{8}$"x26" cross arm braces which should be the size regularly used with the heavier arms.

It is also recommended that where single arms are to be used on two pole corners, that two pair of 26" cross arm braces be used, one pair being placed in front of the arm in regular position and the other pair being placed behind the arm as back braces. The holes for the regular front braces should be 34" apart and the holes for back braces should be 40" to 42" apart, according to size of poles.

Where "Long distance" arms are used in 6 pin length the 22" braces may be used by boring brace bolt holes 28" apart except at corners, where 26" braces should be used.

The 20" and 24" cross arm braces do not conform to any regular cross arm boring and we recommend that they be not used for telephone work where it is of the greatest importance that the braces, for maximum holding power, meet each other exactly at right angles on the pole, where they should be secured by a ½x4" lag screw which is sometimes referred to as a "heel bolt." 1¼x¼x30 inch braces should be used only with 10 pin "Long distance" arms with heavy gauge wire. Brace bolt holes should then be 42" apart.

Cross Arm Back Braces

The committee is inclined to discourage the use of cross arm back braces in connection with telephone arms. On light leads, with arms no longer than 6 pin, two 26" cross arm braces may be used in place of the regular back brace at a considerable saving in cost. For 8 and 10 pin "Telephone" cross arms we recommend double arming, both for corners and dead ends. With "Long distance" and "Telephone special" arms double arming need not be used except when required by law or at dead ends, as single arms, properly back braced, will be found satisfactory for 2 pole corners. When found advisable to use regular back braces, we recommend the 1½"x1½"x⅛"x6' galvanized angle back brace, or the 1½"x⅜"x6' flat galvanized back brace.

Although these braces are practically identical in cost, the flat brace is nearly twice as heavy and is considerably stronger and we are inclined to recommend it in preference to the angle brace which requires very expensive machine operations in its manufacture while practically all mills have facilities for getting out the flat braces.

Guy Clamps

It is recommended that purchases be confined to the following sizes and descriptions:

3 bolt, 6" rolled steel, 3 bolt universal,
3 bolt, 4" rolled steel, 2 bolt universal,
$\frac{5}{16}$" and ⅜" U bolt clamps and ½" U bolt clamps.

We also recommend the Mathews boltless clamps in the baby pattern for ¼" guy strand and in the giant pattern for $\frac{5}{16}$", ⅜" and $\frac{7}{16}$" guy strand.

"Universal" clamps with articulating teeth are now offered by several prominent manufacturers and have come into considerable favor, but from the standpoint of strength their extra cost is not justified, and until they are obtainable at a lower price, we recommend the regular rolled steel clamps instead.

We also recommend U bolt clamps for use between the pole and the regular 2 or 3 bolt guy clamp where there is a tendency for the strand to tear out of the guy clamp due to the large diameter of the pole. Some companies also insist on using a U bolt clamp at the thimble of each guy rod. U bolt clamps are quite inexpensive and should be in more common use. They are amply sufficient to hold a great many light strains and can often be used to great advantage in connection with 2 and 3 bolt clamps where heavier strains are to be cared for.

Guy or J Hooks

Guy or J hooks should always be used to prevent guys from creeping down as it is not sufficient to bend the angles on ordinary pole shims and use them for the same purpose.

It is recommended that 1¼x⅜x4 inch one bolt J hooks with $\frac{11}{16}$" hole be used in all cases, as the one bolt hook can adjust itself to the proper angle for holding the strain while the 2 bolt J hook cannot so adjust itself and frequently shows a tendency to make the lag screws or the through bolts tear the pole. Where any important strain is to be held J hooks should always be attached with a ½" or ⅝" machine bolt passing clear through the pole as this holds much more securely and does not tear the pole so much as does the driving of lag screws from each side.

Messenger Hangers or Strain Supports

Messenger hangers or strain supports should be of the one bolt type only, as these hold more securely and with less chance of injuring the pole than do the two bolt L type hangers.

The one bolt messenger clams are regularly furnished without bolts and either machine or double arming bolts can be used with them. It is usually advisable to employ double arming bolts for this work and this should always be done where there is any prospect of requiring another messenger strand on the opposite side of the pole, for when double arming bolts are used the second messenger strand can be added at any time without disturbing the strand already in place. The regular one bolt clamps are universal as to size and will securely hold any ordinary messenger strand.

Pole Shims and Strain Plates

1x$\frac{7}{16}$x8" is the most suitable size of shim for ordinary work and where heavier shims are required your committee recommends the use of 4x8x⅛" strain plates instead. All these shims and strain plates are regularly equipped with nail holes and both shims and strain plates can be used in connection with the galvanized J hooks already described.

Pole Steps

Pole steps, $\frac{7}{16}$x9", should be used wherever steps are needed except for the first 7 feet above the ground where regular wood steps should be used. It is also recommended that Pole steps be arranged parallel to the direction of the lead rather than at right angles to same.

Pole Protection Strips

Pole protection strips, 2"x48", should be used wherever poles are likely to be gnawed by horses. These are pointed at top and bottom and attach with ordinary nails.

Hub Guards

Hub guards, 15"x18", weighing 14 lbs. or 18"x22", weighing 21 lbs., should be used at the hub level, wherever poles are exposed to traffic for, at such points, ordinary protection strips are not sufficient to guard poles against injury.

Lag Screws

Lag screws should be used only for attaching cross arm

braces to poles and machine or carriage bolts should be used for attaching braces to cross arms and for all other purposes. ½"x4" lags should be used for attaching cross arm braces to poles.

Where it is necessary to attach braces to arms already erected, it is permissible to use ⅜"x2¼" lag screws for this purpose on account of the great difficulty of boring cross arms which are in place. But in attaching cross arms to all poles which have not been bored for "through bolts," the poles should be bored instead of attempting to attach the cross arms by means of large lag screws, as lags in old poles afford very insecure construction.

Guy Thimbles

Guy thimbles should be used at the eyes of all anchor rods as the increased strength given the strand by their use will take care of their slight trivial cost.

Thimbles should be purchased in ⅜", ½" and ⅝" sizes and the thimble groove should always be considerably larger than the strand with which it is to be used, as it is very difficult to use ⅜" strand with smaller than ½" thimble while ⅝" is a still better size for ⅜" strand and is essential with $\frac{7}{16}$".

Bridle Rings

Bridle rings should be used in the galvanized style only for out door work, but enameled bridle rings may be used for running silk or cotton insulated jumber wires on wall type distributing racks. ⅝" eye, 1¼" eye, 1⅝" eye and 3" eye should be the only sizes employed.

Cable Rings

Cable rings should be ordered in the Type D only as these are much easier to attach and hold equally as well as the Type C which is now practically obsolete. The following sizes are recommended: 1¼" for 100 pair cable and smaller, 2" for 200 pair cable and smaller, 2½" for 400 pair cable and smaller. Crimping pliers are required for attaching above rings and the No. 1 should be ordered for cable rings 2" and smaller while the No. 2 should be ordered for cable rings 2½" and larger.

Turn Buckles

Turn buckles should not be used in first class telephone construction, as they usually represent the weakest portion of the guy, and are wholly unnecessary where good construction methods are employed. When turn buckles are required for special purposes they should be ordered in the double eye style, galvanized, only, as nothing is more dangerous than a turn buckle equipped with hook at one or both ends. ⅝"x9" and ⅝"x12" should be the only sizes ordered for telephone work.

Ground Rods

Ground rods should be ordered in the ½"x6' size, galvanized, where they are to be used either for ringing or talking purposes, and ⅜"x6' ground rods either galvanized or plain should be used only on metallic circuits where an arrester is employed at the telephone and the rod has nothing to do except conduct lightning to earth.

On actual test, at the end of a long country line, a 3 bar bridging telephone with a ½"x6' galvanized ground rod will be found to ring in better than will a 5 bar telephone having a ⅜"x6' plain rod, and as the difference between the cheapest and best ground rods is but trivial and really affects the service more than the difference between a 3 bar and a 5 bar telephone, there is no excuse for using ground rods of poorer quality than ½"x6' galvanized.

It is further recommended that tails of not lighter than No. 12 B. B. iron wire be soldered to ground rods in the shop, where it is much easier to do a good job of soldering than it is at the subscriber's premises.

Efficiency of rural telephone service could be revolutionized by installing adequate ground rods and we trust campaigns for such service betterment will be promptly inaugurated.

Old ground rods can be pulled by bending over a few inches of the top portion and twisting them until they can be taken out, after which, if they are galvanized, they can be taken to the shop and have well soldered tails attached and be used in connection with city telephones where the ringing conditions are less difficult than on country lines.

Ground Clamps

Ground clamps afford the only satisfactory substitute for a thoroughly soldered connection and are also advisable in city exchanges where it is possible to connect to a galvanized water pipe, which is always preferable to a ground rod when available.

Pole Seats

Pole seats should be of galvanized channel steel construction similar to No. 3 or No. 4 Pierce, which styles are now offered by several prominent manufacturers.

Square Washers

Square washers should be used in connection with machine bolts, double arming bolts, anchor rods, one bolt messenger supports and similar purposes. While the 2x⅛" square washer can now be had with $\frac{11}{16}$" hole so as to take ⅝" machine and double arming bolts it is recommended that the heavier 2¼"x$\frac{7}{16}$" square washer be used for these purposes and with ½" and ⅝" anchor rods, also that 3x¼" or 4x¼" square washers with $\frac{11}{16}$" holes be used for larger sizes of anchor rods.

Round Washers

Round washers should be used only under heads of cross arm brace bolts, the proper size being 1⅛" diameter with $\frac{9}{16}$" round hole, which hole fits over the square shoulder of the carriage bolt and prevents the head from cutting into the soft fir cross arm. When ⅜" machine bolts are used for cross arm brace bolts 1" or 1⅛" round washers with $\frac{7}{16}$" hole should be used.

Galvanized House and Pole Brackets

These have come into general use during the past few years by the larger companies but in view of their cost we recommend that the house brackets be used as infrequently as possible and that the pole brackets be used only where it is necessary to drop two or more pairs of wires from the same pole.

Except when necessary to approach a plane surface at an angle more perpendicular than 45 degrees, equally secure construction can be had by attaching a two groove telephone knob directly to the house by means of a No. 20 galvanized wood screw and it appears unnecessary to use an expensive galvanized bracket in addition to a knob when only one circuit is to be dropped from a pole. But when two or more circuits are to be dropped from the same pole we recommend the galvanized pole bracket fitted with one or two 4 groove telephone knobs. For attaching one 4 groove knob use a ⅜x3" galvanized stove or machine bolt and for two 4 groove knobs, use a ⅜x5½" stove or machine bolt. Pole brackets should be attached with two ⅜x2¾" galvanized lag screws.

On single wire grounded lines the No. 4, single groove porcelain knob attached with a 3½" No. 16 galvanized wood screw is recommended instead of the more expensive 2 groove telephone knob.

When the side of a house must be approached at nearly right angles a galvanized house bracket, attached with 3 No. 14 galvanized wood screws, should be used, carrying one 2 groove telephone knob secured with a $\frac{5}{16}$x2" galvanized stove or machine bolt or two 2 groove telephone knobs secured by a $\frac{5}{16}$x3½" galvanized stove or machine bolt. House and pole brackets should never be ordered assembled but the brackets, bolts and knobs should be ordered and stocked as separate items and assembled as needed by conditions encountered. Thus total stock requirements will comprise:

Galvanized House Brackets—
- $\frac{5}{16}$x2" Galv. Knob Bolts (Stove or Mach.)
- Nos. 14-16-20 Galv. Wood Screws.
- 2 Groove Telephone Knobs.
- ⅜x5½" Galv. Stove or Mach. Bolts.

Galvanized Pole Brackets—
- 4 Groove Telephone Knobs.
- $\frac{5}{16}$x3½" Galv. Knob Bolts (Stove or Mach.)
- ⅜x3" Galv. Stove or Mach.
- ⅜x2¾" Galv. Lag Screws.

GALVANIZED WIRE AND STRAND

Wire Gauges

Much confusion results from the fact that there are two different wire gauges in common use in Independent telephone practice. Iron and steel wire is usually designated in the old Birmingham wire gauge as "B. W. G.," but sometimes designated as "Stl. W. G.," from the fact that its use in Independent telephone practice is ordinarily limited to iron and steel wire.

With the advent of the electrical industry the need of a more scientific wire gauge was felt which resulted in the adoption of what is ordinarily known as the Brown and Sharpe "B. & S." gauge, although it is sometimes known as the "American wire gauge," or "A. W. G."

In the B. & S. gauge the multiplying factor between the cross section of each size and that of the next larger size is the cube root of 2, or approximately 1.27. It will be noted that when this factor is used three times the cross section and weight of the wire has been doubled and conversely its resistance has been reduced one-half.

If this fact is borne in mind together with the fact that the resistance of No. 10 B. & S. copper wire is approximately 1 ohm per thousand feet, rough mental calculations can always be made by bearing in mind that

No. 13 wire has twice the resistance and ½ the weight of No. 10 wire.

No. 16 wire has 4 times the resistance and ¼ the weight of No. 10 wire.

No. 19 wire has 8 times the resistance and ⅛ the weight of No. 10 wire.

No. 22 wire has 16 times the resistance and 1/16 the weight of No. 10 wire.

This probably explains why No. 16, No. 19 and No. 22 have become such popular sizes in telephone wire as they bear an even relation to the No. 10 B. & S. size, which a telephone man is likely to make the basis of his mental calculations.

It can be borne in mind that

No. 14 B. W. G. iron wire is approximately the same size as No. 12 B. & S. copper.

No. 12 B. W. G. iron wire is approximately the same size as No. 10 B. & S. copper.

No. 10 B. W. G. iron wire is approximately the same size as No. 8 B. & S. copper.

Owing to the fact that rubber insulated copper and copper clad steel wires are regularly rated in the B. & S. gauge, it is becoming increasingly popular, as a matter of convenience, to rate "Ironite" or rubber insulated iron wire in the B. & S. gauge rather than in the B. W. G. and the "Ironite" wire most commonly used should always be designated as No. 16 B. & S. or No. 18 B. W. G. as there is great opportunity for confusion and misunderstanding if the gauge be not stated as well as the size.

This confusion in gauges is another example of the need of further standardization in telephone matters but as so small a percentage of iron and steel wire finds its way into the telephone field, it will probably never be possible to secure iron wire in the B. & S. gauge, and we do not believe that the old cumbersome Birmingham gauge or the newer "New British Standard," "N. S. B." gauge, should be adopted for copper wire, although a great many of the Bell Companies are using the N. B. S. gauge on their copper line wires. The B. & S. gauge has become so familiar in connection with copper wire in Independent telephone practice that we believe it should be retained and but little confusion will arise in connection with iron wire of the B. W. gauge if it is borne in mind that for all sizes of iron wire common to telephone practice, the B. & S. gauge practically equivalent is two sizes larger.

Galvanized Wire

Galvanized wire for telephone work has always been offered in three grades, designated as E. B. B. (Extra Best Best), B. B. (Best Best), and Steel. These wires are all double galvanized but in our opinion only the B. B. grade should be used for telephone work.

While the Extra B. B. wire was formerly very popular for telegraph lines because of its low ohmic resistance, this saving in resistance for telephone purposes is not enough to justify its inferior mechanical strength and its inability to stand up in times of storm without the necessity of pulling slack at the beginning of the next warm weather season. Besides the Extra B. B. wire is very much more expensive.

Steel wire, on the other hand, should not be used as its increased resistance over B. B. is too great to be considered for the small saving in cost, and the inferior mechanical qualities. For while steel wire is stronger than B. B. it is so much more subject to mechanical injury in stringing that it does not afford as reliable a line, and telephone companies will do well to confine their purchases to the B. B. grade which is obtainable from at least four prominent manufacturers in quality sufficient to pass the standard galvanizing test of four 1-minute immersions in a saturated solution of blue vitriol at a temperature of 68 degrees Fahrenheit without eating through the galvanizing.

No. 12 B. B. should be used exclusively for country line service, including spurs. No. 14 B. B. should be used exclusively in city exchange work except where heavier wire may be required by law for railroad crossings. No. 10 B. B. was formerly used for short length toll lines but it is becoming increasingly popular to string four No. 12 wires instead and form the toll circuit from a phantom composed of two No. 12 wires on each side which gives two No. 12 physical circuits to be used for "short haul" conversations, so that it begins to look like iron wire for telephone purposes would settle down to No. 12 B. B. and No. 14 B. B. almost exclusively.

Galvanized Steel Strand

Galvanized steel strand is regularly offered in four grades: Single galvanized regular strand, double galvanized Siemens-Martin Strand, high strength and extra high strength strand.

This committee recommends that the first two grades only be used for regular exchange, farm line and toll construction, as the extra cost and difficulty of handling the high strength extra high strength strand renders its use inadvisable in small exchanges.

We also recommend that the single galvanized regular strand be used in country line construction only, where there is no possibility of deterioration from smoke conditions, and for city exchange work, we recommend the use of double galvanized Siemens-Martin strand, as stated.

Its double galvanizing insures long life under smoky conditions, it is tempered highly enough to be strong but is not so highly tempered as to prevent its being tough, and when not convenient to use clamps it can be successfully "made up" in the old-fashioned way, provided the twist is made in the direction which increases the twist in the body of the strand and, in country line construction, a substantial saving can be effected through using old-fashioned "make-ups" in place of guy clamps. And near school houses, and at other points where clamps are likely to be tampered with, the old-fashioned "make-up" offers a very great advantage in that it cannot possibly be disturbed.

Following sizes of strand are recommended, the strengths indicated being those of the Siemens-Martin grade:

3060 lb. ¼" composed of 7 No. 14 B. W. G. wires. Bracket lines only.

4860 lb. 5/16" composed of 7 No. 12 B. W. G. wires. Light messenger and guys.

6800 lb. ⅜" composed of 7 No. 11 B. W. G. wires. Medium messenger and guys.

9000 lb. 7/16" composed of 7 No. 10 B. W. G. wires. Heavy messenger and guys.

Half-inch strand is not recommended for the reason that it is composed of 7 strands of No. 8 B. W. G., which makes it too large and unwieldy for regular telephone work and where ½" strand is required for guys it is far preferable to use two strands of ⅜ or 7/16", which is but a trifle more expensive and is considerably stronger.

INSULATORS

Line Insulators

Perhaps 95 per cent of all Independent telephone lines, local, rural and long distance, are equipped with No. 9 single groove or No. 12 double groove Hemingray glass insulators or their equivalents in the No. 9 single groove and No. 31 double groove Brookfield insulators.

Porcelain insulators have never come into general telephone usage, although undoubtedly superior to glass insulators in mechanical qualities, especially as regards their ability to resist breakage by the small boy and his target rifle. Porcelain insulators of corresponding sizes are considerably more expensive than glass insulators, but there has recently become available a smaller type of porcelain insulator known as the No. 107 single groove and No. 108 double groove, which are about the same in cost as glass insulators and which we unhesitatingly recommend for new work in connection with pins and brackets specially threaded for telephone insulators. The Nos. 107 and 108 Porcelain insulators should not be used on the old style pins and brackets threaded to take insulators larger than the No. 9 and No. 12.

This committee believes that if these smaller porcelain insulators come into general usage the price of same will be greatly reduced through manufacturing in quantities, as a great many manufacturers of large porcelain insulators who do not make porcelain insulators for telephone work, would be glad to do so could they depend on demands for a quantity of this product.

We hope Independent companies will thoroughly try out this new insulator as the special telephone pins and brackets herein recommended become available.

As Brookfield and Hemingray insulators seem to be practically equivalent, we would suggest that your jobber be given the privilege of filling your orders with either and that you merely specify No. 9 single groove or No. 12 double groove insulators, without specifying the brand.

We recommend that the larger No. 109 and No. 112 procelain insulators be not used for telephone work, because of their extremely high cost and the equal utility of the smaller porcelain insulators for telephone work.

Very few independent companies have ever used what is known as the "long distance regular" glass insulator, which insulator your committee does not recommend for anything except extremely long copper toll circuits as the special telephone pins and brackets, herein recommended, do not take this large insulator.

Strain Insulators

Strain insulators can be used to very great advantage in dead ending bracket lines as a wire passing around the pole is certainly the most secure method of doing this work.

For line use, we recommend the No. 500 porcelain circuit breaker for No. 12 and No. 14 iron wire and the No. 502 porcelain circuit breaker for No. 10 line wire or heavier. For insulating guys where telephone lines are near electric light wires, we recommend the No. 508 porcelain circuit breaker.

Porcelain Knobs

Porcelain knobs should be of No. 4 single groove style to accommodate one wire, while 2 or 4 groove special telephone knobs should be used where more than one groove is required.

The 2 and 4 groove telephone knobs are considerably larger and stronger than the No. 4 knob and while they were primarily designed for use in connection with galvanized house and pole brackets, they can be readily attached at the house end by means of large galvanized screws and the expensive bracket done away with. At the pole end the galvanized angle bracket should be used if more than one circuit is to be dropped off, and we recommend that for sake of uniformity 4 groove knobs only be used in connection with pole brackets, one or two of these 4 groove knobs being placed on each pole bracket as required.

Porcelain Tubes

Porcelain tubes should be more generally used by Independent companies in house wiring, and ⅜x8" is the size recommended for general telephone work. A tube cutter is a very inexpensive tool and one of these permits cutting the tube to actual desired length.

INSULATED WIRES

Interior Wire

Interior wire should consist of No. 19 copper, rubber insulated to 3/32 inch, with a dry braid overall. Single conductor, twisted pair and triple conductor to be used as required. It is not generally known that there are two distinct qualities of interior wire should be specified when ordering. We also recom- of copper clad and other rubber insulated wires.

The "no-test" grade is considerably less expensive than the tested wire showing high insulation resistance. No-test wire is frequently entirely suitable for magneto telephone plants, but when wire of special or tested quality is desired, "test grade" terior wire, corresponding to the "test" and "no-test" grades mend that olive green be made the standard color for interior wire, to be furnished in all cases unless some other color be specified. But on account of the difficulty of securing and carrying in stock the single, double and triple conductor wire in more than one color, it is recommended that the olive green interior wire be used wherever possible.

Annunciator wire should never be used in place of rubber covered interior wire, although Annunciator wire may be used in connection with enameled jumper rings in wiring up wall type distributing frames as hereinafter mentioned.

Pot Head Wire

The old fashioned pot head wire should be used as infrequently as possible, as it is far preferable to splice on lead covered cable with wool or silk and cotton insulation and if the latter be thoroughly boiled out in beeswax a much more satisfactory job will be secured than can be had with the troublesome pot head wire.

Even when the lead covered silk and cotton or wool insulated cable can not be had, it is still preferable to splice wax core switchboard cable onto the paper insulated line cable and fill the pot head with a mixture of paraffin and beeswax rather than with the old fashioned pot head compound, and the use of pot heads and pot head compound and rubber covered pot head wire should be avoided whenever possible.

Flame Proof Jumper Wire

Flame proof jumper wire is regularly made in 1, 2, 3 and 4 conductor, No. 20 or 22 copper, rubber insulated and covered with a flame proof cotton braid or enameled and covered with flame proof cotton braid. No. 20 B. & S. G. should be used for toll lines.

The enameled and cotton insulated jumper wire is somewhat cheaper than the rubber insulated and is constantly increasing in favor, especially in damp climates where some trouble with the rubber covered wire has been encountered. The committee recommends that you continue the use of which ever style of wire your main frame is now jumpered with, as it is necessary for all manufacturers to carry in stock both rubber insulated and enameled flame proof jumper wire.

Weather Proof Iron Wire

This is commonly known as "tree wire" and is sometimes called "KK." It should be used only where it is impossible to trim trees or use cable, as the trees are almost sure to chafe away the insulation and allow considerable leakage. This wire should be ordered in half-mile coils only, No. 14, 12 or 10 B. W. Gauge.

Bridle or Spider Wire

This should consist of No. 18 copper wire, rubber insulated to 7/64 inch, with saturated braid over rubber. It is made in single conductor and twisted pair and should be used for connecting bare line wires into cable cans or cable boxes. Also, in extremely small exchanges, hand made cables of this wire may be used for connecting direct from the line wire to the lightning arresters inside the central office, although it is preferable to use for this purpose the special rural cable consisting of spider wire with lead sheath hereafter described.

Copper Drop Wire

This is regularly furnished in No. 14 B. & S. hard drawn copper wire, rubber insulated to 5/32", provided with saturated braid and twisted. It is also regularly made in No. 16 copper with ⅛" rubber and saturated braid.

The No. 14 wire is obtainable in twisted pair only and is commonly used for wiring in toll stations and similar important work. The No. 16 wire is obtainable both in single conductor and twisted pair and is suitable for general usage.

Ironite Drop Wire

No. 16 B. & S. gauge (which is equivalent to No. 18 B. W. gauge) rubber insulated to ⅛" and provided with saturated braid, is recommended as the most suitable Ironite drop wire for Independent practice. This wire is regularly carried in twisted pair only. It needs no introduction to the telephone trade and we do not hesitate to recommend it as reliable and suitable for all purposes where its greater resistance is not objectionable.

Copper Clad Drop Wire

Copper Clad drop wire is regularly obtainable in twisted pair only and consists of No. 17 B. & S. gauge Copper Clad wire, rubber insulated to 7/16 inch with saturated braid over rubber. This wire is offered in two grades, the "no test" and the "tested" grade, which is capable of showing at least one hundred million ohms per mile when immersed in water. We recommend the test grade only.

Weatherproof Copper Wire

Weatherproof copper wire should be used only with porcelain tubes and cleats; also for running ground leads and carrying copper toll lines through trees which cannot be trimmed. Rubber covered and braided copper wire should be used wherever dependence must be placed on the insulation. No. 10, 12 and 14 B. & S. triple braid should be ordered where it is necessary to use weatherproof copper wire, as these are sizes commonly used in electric light practice and are consequently always obtainable.

Annunciator Wire

Annunciator wire should never be used for interior wire or about the subscribers' premises, although it may be used in connection with enameled jumper rings for wall type distributing frames. It is recommended that No. 20 single conductor plain and No. 20 twisted pair plain be the only sizes used for this work. Annunciator wire should never be used in making or repairing key cables as the regular switchboard wire listed below should always be employed for this purpose.

Switchboard Wire

Switchboard wire should always be used in making additions or repairs to switchboard equipment. It consists of No. 22 tinned copper wire with one or two wrappings of silk and a cotton insulation over all. This wire is obtainable in a large variety of color combinations and in making additions or repairs it is usually possible to secure wire which will match the wire already in service. Switchboard wire may also be used in place of annunciator wire in wall type distributing frames, but when so used the jumper rings should always be enamel insulated.

Special qualities of switchboard wire with braided insulation are obtainable for running generator circuits and in repairing old boards, it is advisable to use this wire and to use rubber covered wire as infrequently as possible.

CABLE AND CABLE SUPPLIES

Paper Insulated Line Cable

This committee recommends for Independent work No. 22 B. & S. wire with two paper wrappings applied in reverse directions, or one paper wrapping equivalent in quantity to the two paper wrappings applied in one direction. Pure lead sheath should be used only where the cable is to be laid in an open trench and where it is to be suspended on messenger, or where long lengths of cable are to be pulled underground, we recommend a composition sheath containing about 3 per cent of tin or antimony. Such cable should be guaranteed to show an electrostatic capacity of not more than 12 micro farads per mile when each conductor in the cable is measured against all the other conductors grounded to the sheath.

The sheath thicknesses recommended are indicated in the following table:

Pairs	*Sheath*	*Pairs*	*Sheath*
10	1/12	100	3/32
15	1/12	150	3/32
25	1/12	200	⅛
50	1/12	250	⅛
75	3/32	300	⅛

In requesting quotations always give your manufacturer or jobber exact lengths of each size as closely as you can figure them, as this has an important bearing on the delivered cost.

Toll lines should be brought clear to the central office whenever possible and brought in with the special rubber insulated rural cable next described. When several blocks of toll cable cannot be avoided No. 19 gauge paper insulated, lead encased toll cable protected at the outer end with tubular fuse and metal or non-smut carbons should be used.

Underground Cable in Small Plants

Underground cable was once supposed to be something beyond the reach and knowledge of the ordinary telephone man, and something that could not be undertaken without an abundance of capital, engineering talent, concrete machinery and vitrified conduit.

Of late years, however, the development and perfection of fibre conduit has robbed underground work of much of its "pomp and ceremony," while scores of underground installations which have been working for years with cables buried directly in the earth, indicate there is no longer any excuse for stringing small exchange cables on poles over old frame fire traps when there is no paving in the way of putting the cables underground.

Great care must be taken before burying cables directly in the earth to make sure there is no prospect of an electric railway or the electrifying of an old steam railway. If there is any such prospect, even remote, it will pay to use the fibre conduit even if the latter is buried directly in the earth. For best results, however, it is recommended that enough concrete be used with fibre conduit to hold it in good alignment and to prevent mechanical injury from above.

Where there is no probability of an electric railway, cables may be laid in the bottom of dirt trenches and covered with half tile or may be buried in small sub-trenches and covered with 2"x12" planks treated with hot creosote oil and laid on the bottom of the main trench. In either case the cable should be laid on and covered by tarred building paper. These latter methods offer a very great advantage over conduit in that every foot of cable is accessible with a little digging to take up one section of tile or plank. In case of damage to any portion of the cable, the location of the fault can be determined approximately by voltmeter tests and that section of the cable opened up by an ordinary laborer. The exact location can then be made with an exploring coil and the trouble repaired without cutting the cable in two.

Pure lead sheath is recommended in all cases where cables are to be laid in the earth, as earth salts are likely to attack alloy sheaths while pure lead coffins which have remained buried for centuries have been so little effected that only a scratch of the finger nail was needed to reveal bright new lead.

Where underground cables are to be brought up poles, an iron pipe with a 90 degree bend below the ground should be used part way up the pole as mechanical protection for the cable. In case of damage to the cable inside this pipe, it can be slipped up the pole and the bad spot in the cable repaired without cutting it in two.

The prospect for trouble in cable properly installed and properly protected from lightning and moisture is so remote as to be almost negligible and cable should be replacing old leads of rusted-out open wire in small plants much more rapidly than it is. The burying of cables directly in the earth is recommended for small exchanges because "it works" and in the belief that a greater knowledge of this method will stimulate the use of cable and result in much general improvement work.

Special Rural Cable

This cable has been produced to secure a safe and satisfactory cable for toll and rural lines in place of the unsightly hand made cables of rubber covered wire often used for this work. This cable comprises 25 pairs of No. 18 B. & S. gauge copper wire, rubber insulated to 7/64", braided, saturated, twisted, cabled, taped and leaded with a heavy sheath. In other words, a lead encased cable of heavy spider wires which can be fanned out on the office pole and carried direct to the lightning arresters inside the office.

We earnestly recommend the use of this cable in small exchanges where all lines are brought to an office pole in open wire. The use of this cable then does away with spider wire, cable terminals, paper insulated cable, special terminating cable and other nuisances incident to the use of paper cable. Put a ground wire on the office pole and each of its crossarms, leaving the dead end tails of the line wires pointing toward the ground wire and enjoy complete freedom from carbon smut and other lightning troubles.

Switchboard Cable

Switchboard cable is obtainable in practically all sizes from 11 pair to 102 pair inclusive, 22 gauge tinned copper with one silk and one cotton insulation or with two silk and one cotton insulation. The cable is also provided with a cotton braid over all which can be beeswaxed and polished or painted with fireproof asbestos paint.

For independent work we recommend the use of switchboard cable with beeswax core exclusively. For runs of a few hundred feet and less the increased capacity of the beeswax core cable is negligible and the cable is much more reliable and much more speedy to work, due to the fact that the formed ends are already boiled out and that the cable has no dry core to protect. The beeswax core requirement applies particularly to cables having the flame proof braid, as the flame proof braid is very much farther from moisture proof than is a beeswax braid and where the core of the cable is not beeswaxed, trouble is likely to be encountered in wet locations from the entrance of moisture through the outer braid. Switchboard cable of No. 19 B. & S. gauge is also obtainable and should be more generally used in wiring toll line switchboards.

Marlin Hangers

In the committee's opinion Marlin hangers should be used as infrequently as possible, as galvanized cable rings are permanent for the life of the cable, whereas it has been found that the Marlin hangers furnished heretofore require replacal long before the cable has to be disturbed for any other reason.

If absolutely necessary to order Marlin hangers, specify the "Best" grade and give size of cable which they are to suspend.

Marlin Twine

Marlin twine should be used for supporting cables at turns and splices for which purpose the 3-ply tarred Marlin twine is recommended.

Paraffine Wax

In ordering paraffine wax specify "commercial quality" and save money, as some jobbers otherwise furnish the highest quality of "condenser wax" although the "commercial" is equally suitable for boiling out cables for splicing.

Beeswax

Beeswax should be used in preference to paraffin wax in boiling out silk and cotton and wool insulated cables.

Cable Compound

Cable compound, as already discussed under *Pot Heads*, should be used as infrequently as possible.

Lead Sleeving

Whenever possible give the exact lengths of sleeves required which greatly assists the jobber in securely packing your order for shipment. The following table gives the diameter of lead sleeves required for making straight splices in 22 gauge cable. When branch splices or heavier cable is encountered, larger sleeves should be used.

Inside Diameter	*Largest Cable*	*Smallest Cable*
1½"	100 Pr.	25 Pr.
2"	150 Pr.	100 Pr.
2½"	250 Pr.	150 Pr.
3"	400 Pr.	250 Pr.

Paper Cable Sleeves

These should consist of seamless paper tubes, 1/8x2¾ inch should be used for straight splices and 3/16x3 inch should be used for branch splices in 22 gauge cable.

Wiping Solder

Either half and half or National wiping solder or equivalent should be ordered and the cable man can temper such solder to his individual liking by the addition of lead cable sheath.

Wire and Rosin Core Solder

Wire solder should be used in connection with paste for soldering all copper to iron connections. Rosin core solder only should be used in telephone and switchboard instrument work.

The secret of soldering with rosin core solder is simply to have a clean, hot, soldering copper. Take the dirty one found in the average exchange, clamp it in a vice and file the four sides of the point bright and smooth. Turn the blow torch, not on the filed surface, but on the butt of the copper and let the heat work out to the point. As the copper grows hot, keep trying the filed surface with rosin core solder and as soon as the rosin will melt take the copper away from the fire and rapidly "smother" the point with a plastic mixture of molten solder and rosin. As soon as the air has been excluded from all the newly filed surface put the butt of the copper back in the blow torch flame and let the solder and rosin "sweat." If the point of the copper is now kept out of the flame there is little danger of getting the copper too hot and the hotter it is the better the solder will work.

Don't use too much air pressure on the blow torch. A gentle pressure and a quiet flame of large volume is preferable to a "blast" and heats the copper better and more uniformly.

Rosin core solder can be used on any wires or terminals that are bright and clean, as well as on those that are tinned, and when wires or terminals are slightly corroded, a bit of fine sandpaper will soon put the joints into condition so that rosin core solder can be used.

Unsoldered connections are most frequently found on arrester and cross connecting equipments and where additional drops have been installed and the switchboard cable wires merely wrapped around the terminals. In soldering, best results will usually be had by touching the end of the rosin core solder on top of the joint and applying the copper in such manner as to melt off a sixteenth of an inch or so of the solder and sweat it into the joint. With a large soldering copper heated nearly red hot, perfect joints can be made almost as rapidly as they can be touched.

When soldering on vertical racks, always work from the top down to avoid the danger of overlooking short circuits from possible solder drippings, though when solder is properly applied it should all be used and there should be no drippings. When soldering in additional drops, a piece of cardboard slipped in immediately below the row being soldered will prevent possible trouble from solder drippings.

Soldering Paste

Soldering paste is recommended in preference to the soldering stick. There are many pastes of excellent quality on the market and we would suggest that you continue to use some paste which your jobber always has in stock and which he recommends and you find suitable for the work.

Soldering paste must not be used in switchboards or instruments. For this work use rosin core solder only.

Tape

Friction tape should be used for all telephone work. The rubber tape should be used on power work only and as infrequently as possible.

Cable Straps

Ordinary galvanized pipe straps should be used for fastening cable to pole or wall.

ARRESTERS AND LIGHTNING PROTECTION

In attempting to suggest standards for lightning protection for Independent companies, your committee encounters by far the most difficult portion of this entire subject. Nearly every telephone man has his own pet ideas as to how lightning and high tension current should be protected against and not many of them are willing to change in any respect from their present equipment and practice, if it is in the least satisfactory.

Yet, there is no doubt in our minds that there is no greater room for improvement than in the lightning protection commonly employed and the results secured therefrom.

Most of the lightning protection used by Independent companies is sufficiently efficient as regards protection against lightning, but it is not always efficient as regards protection against other forms of high tension current which it is becoming increasingly important to guard against, and the greatest difficulty of all is that so much of the lightning protection now in common use causes trouble on the lines during lightning season more rapidly than the trouble can be kept clear.

It is coming to be generally recognized that the carbon arrester fitted with mica separator is the only efficient and inexpensive arrester against lightning. While it will be impossible for us to furnish a complete list of approved protective devices for various purposes, we shall endeavor to mention the leading representative types and outline the practice which is being followed by large numbers of the most successful companies.

Central Office Protection

This should consist of some form of carbon lightning arrester fitted with "U" shaped mica separators with the open space of the U at the bottom to prevent the accumulation of dust. In the protection of anything larger than a 25 line wall switchboard, it is advisable to use a fuse in connection with the carbon arrester. When this fuse is of the mica type it is usually ¼ ampere and is placed between the carbon and the switchboard so that it is not likely to be blown by lightning.

We recommend that this practice be continued where it is considered necessary to use wall type racks and mica fuses, but where the size of the installation justifies a floor type arrester and distributing frame, we recommend the use of carbons with enclosed fuses of approximately 5 amperes capacity placed between the outside lines and carbon, except where trolley current on local lines is to be guarded against, in which case we recommend the placing of some form of heat coil between the line and the carbon, in place of, or in addition to, the tubular fuse previously recommended. It is possible to procure arresters combining tubular fuse, heat coil and carbon, but as such arresters are very expensive, it is usual practice, in Independent work, to dispense with fuses inside the central office when heat coils are used. But in such cases tubular fuses and carbon arresters should be placed between all open lines and the outer end of the lead covered cables.

Thus our general recommendation sums itself up to the use of carbon arresters only for 25 line wall boards and smaller; carbon and mica fuse arresters for 50 to 150 line exchanges and to floor type main frames fitted with carbon and tube fuse for 200 line exchanges and larger, except where trolley current is to be protected against, when a heat coil should take the place of the tubular fuse in the central office.

We further recommend that heat coils be of the wire wound type, as the Graphite heat rods in common use seem prone to develop extra high resistances which in a magneto plant is liable to be overlooked, although it may have an important bearing on the efficiency of toll line transmission.

Special Protection for Toll and Rural Lines

As the longest toll lines are likely to bring in trolley and high tension current from distant towns, it is recommended that toll lines be equipped with tubular fuses, in addition to the regular central office protection unless tube fuses are already a part of the regular equipment, in which case it is not necessary to provide an extra set of tubular fuses for the toll lines. Many companies employ special protection consisting of extra large carbon arresters for their toll lines, which is all right, provided these large arresters are not more liable to develop carbon smut trouble than the high class metallic or non smut carbons now obtainable for use with regular wall and floor type main frames. Other companies are getting splendid results with vacuum arresters at the central office in toll and rural lines and we cannot recommend these vacuum arresters too highly except that where vacuum arresters are used without carbon arresters, there should be a metallic saw tooth spark gap in multiple with the vacuum spark gap so that the line will not be without protection in case the arrester loses its vacuum through mechanuical defect, which these arresters sometimes do, although the defect is not discernable in ordinary inspection.

Protection Between Open Wire and Cable

This protection should consist of a tubular fuse of approximately 5 amperes capacity between the lines and a regular carbon arrester. When mica fuse is used in place of the enclosed type the amperage may be reduced to as low as 2 amperes, but regular practice dictates that the fuse should still be placed between the line and carbon. This is to prevent the carbon arresters and their retaining springs being melted by excessive discharges of current and to prevent the melting or destruction of the entire terminal by a continuous arc in case of a cross with trolley or high tension.

The carbon is supposed to take care of all lighting, and while the fuse should be of such high capacity that it will not frequently blow on low amperage lightning discharges, the fuse should nevertheless be present to prevent the carbon getting more amperage than it can carry in case of cross with a power circuit. We recommend the enclosed type tubular fuse for cable terminals in preference to the mica type as the former is well worth its increased cost. We further recommend the protection of all cables which distribute with bare wire, although where the distribution is accomplished by means of twisted pair rubber covered wire, unprotected terminals should be used.

Protection at Subscribers' Telephones

At each telephone, served by a grounded line, there should be a carbon lightning arrester and most manufacturers regularly equip their magneto telephones with lightning arresters of the carbon disc type. Most manufacturers further recommend that no other arrester be used on grounded lines. We believe, however, that wherever there is a considerable length of interior wire on grounded line installations, an additional arrester, either of the carbon, or carbon and tube fuse type, should be placed where the wires enter the building. This applying both to telephones on city exchanges and on rural lines.

The question as to what lightning protection should be used at the telephone on metallic circuits seems to be the most unsettled one in the Independent field. With all forms of carbon arresters at the subscribers' telephones, carbon smut is a very serious proposition and as a metallic circuit accumulates just twice as much carbon smut as does a grounded line and is much more seriously affected thereby, an increasingly large number of Independent companies are being converted to the wisdom of dispensing with lightning arresters and grounds at the subscribers' station on metallic circuits and placing instead some trouble-proof means for allowing the lightning to escape to earth before it enters the subscriber's premises.

This often consists of merely placing a ground wire on the pole from which the subscriber's drop wires are run and extending the ground wire across the face of the arms and bending down the tie wire or deadened tails so that they point towards the ground wire and are within one-half inch to an inch of it. Other companies are adopting special forms of non-smutting all-metallic arresters for the same purpose, but, regardless of the means adopted for getting rid of the lightning on the pole

line, it cannot be denied that all companies who have dispensed with grounds at the telephone on metallic circuits, both on city exchanges and on country lines, are giving superior service at far lower maintenance expense, and we know of no instance where any accident or excessive lightning damage has ever resulted from dispensing with the ground at the telephone on metallic circuits.

If the telephone is already equipped with a lightning arrester by the manufacturer it is permissible, and even advisable, to leave this lightning arrester bridged across the telephone as a protection against any high tension voltage that might be encountered across the circuit. But when connected in this manner the telephone arresters are absolutely unaffected by earth seeking foreign current such as lightning. Carbons, therefore, remain free from smut year in and year out, and, in the language of one of the enthusiastic users of this system, "The telephone millenium has arrived."

In dispensing with grounds at the subscribers' premises, due precaution should be taken not to mount the telephone where the user's person will be in contact with a radiator or other grounded metallic object, and this precaution must be observed regardless of the protection used, for there will always be those who persist in using the telephone during the most severe storms.

The only reason why grounds at the subscribers' stations continue to be used by so many of the larger companies, is their fear of legal complications in case of serious or fatal injury to one of their subscribers, and although most of them know that a lightning arrester at the telephone is just as likely to cause a lawsuit as to prevent one, the tendency of large companies is to adhere to the practice of using lightning arresters and grounds at the subscriber's premises on the theory that should an inevitable accident occur, they would be held less blamable because they had provided a special device supposed to render such injury more improbable.

The question is one for each company to decide for themselves and where it is decided to use grounds at the subscriber's premises, only the very best quality of carbon arresters should be employed as high quality carbon shows less tendency to smut than does cheaper carbon and wherever there is exposure to lightning and power circuits, as well as lightning, tubular fuses should be provided between the lines and the carbon arresters for the same reason that they are recommended between open wires and terminal cans.

Fuse Blocks

Fuse blocks fitted with mica fuses and without carbon arresters in our opinion have no proper place in telephone practice and do not offer adequate protection against lightning and should be discarded forthwith, or supplemented with carbons.

On account of the bother and difficulty of replacing low amperage mica fuses at subscribers' telephones, we believe their use for this purpose should be discontinued and that the only fuses used at subscribers' telephones be tubular fuses of approximately 5 amperes capacity which should be placed between the line and any carbon arrester which may be used to protect the telephone.

MISCELLANEOUS SUPPLIES

Wire Connectors or Sleeves

Hard drawn copper wire of the gauges commonly used in telephone practice can be spliced successfully only by the use of copper sleeves or connectors, which should be ordered by stating the size and gauge of the copper wire to be spliced.

In the case of iron wire there is a natural diversity of opinion among construction men as to the wisdom of using sleeves, but your committee can recommend that where it is decided not to use sleeves the splices should be of the 3-wire type and where any splices are subjected to smoke conditions they should be thoroughly soldered. Three-wire splices, on rural lines out in the country and away from smoke conditions, can be depended on to remain good indefinitely, provided they are kept under the strain of the line. The secret of a well-made joint in iron wire, both mechanically and electrically, is all in the twisted neck and particular attention should be given that the neck of the joint between the two made up ends be of ample length and well twisted and that the wire in the twisted neck retain its galvanizing intact.

When it is decided to use sleeves in splicing iron wire, we recommend the use of tinned copper sleeves as being superior to tinned steel sleeves in electrical qualities, and although the copper sleeve is probably somewhat weaker than the steel sleeve mechanically, it nevertheless possesses sufficient strength to hold all strains to which the wire may properly be subjected, as more joints give way as a result of the wire being overpulled than ever give way as a result of storms and other unavoidable causes.

Wood Screws

While Nos. 7, 8 and 9 round head blue wood screws are commonly used for hanging telephones, we believe No. 8 could be used in practically all instances in 1½", 2" and 2½" length.

For attaching No. 4 single groove porcelain knobs use 3½" No. 16 galvanized wood screws. For attaching 2-groove telephone knobs, use 3½" No. 20 flat head galvanized wood screws. For attaching galvanized house brackets, use 1½" No. 14 galvanized wood screws.

Fire Extinguishers

We believe every telephone plant, no matter how small, should have at least one liquid fire extinguisher of the Pyrene or Johns Manville type permanently installed near the switchboard and lightning arrester equipment. Also that each multiple switchboard be provided with a sand bucket and scoop.

The operating force should be thoroughly drilled in extinguishing blazes with sand, when possible, and with the chemical liquid when the fire has gained too much headway for sand. Every utility owes such preparedness and precautions against service interruption to its patrons.

Knife Switches

Knife switches for telephone work should be designed to furnish light and reliable connections more than for the passage of a large quantity of current and for this reason we are inclined to recommend knife switches with fold-over jaws of the Trumbull pattern, which are now made by a larger number of manufacturers.

Perfection Nails

Perfection nails are also known as Milonite nails and are sometimes designated as insulated head tacks. They are in our opinion without doubt the most satisfactory means yet devised for securing interior wire and we recommend their use in preference to insulated saddle staples, except where single wires are to be run, in which rare instances the saddle staples are of course superior. It is recommended that ½" perfection nails be used for fastening wire to wood and ¾" nails be used for fastening wire to plaster, also that the same lengths of insulated saddle staples be used for securing single conductor interior wire to wood and plaster respectively.

TELEPHONE TOOLS

Under this heading we have not attempted to list all the tools required for the proper maintenance of a telephone plant, but only to list a few of those special to telephone work which are most commonly used and stocked, so that one unfamiliar with ordering such tools, may know that sizes other than those listed herein, are likely to be delayed when ordered from jobber's stock.

Splicing Clamps

Specify "Klein's" if wanted. Otherwise specify make desired and state that they shall be similar to following "Klein" numbers:

Cat. No.	*Length*	*Description*
102-3	10½"	5 Round Holes, 6 to 14 Iron.
102-1	7"	4 Round Holes, 12 to 18 Iron.
132-3	10¾"	5 Round Holes and 4 Sizes Sleeve.
132-2	9"	4 Round Holes and 3 Sizes Sleeve.

Climbers

We recommend "Eastern Pattern" with punched loops, "Klein's," or equivalent, in 15½, 16 or 17" length. Specify angle straps for bottom and regular top straps with plain leather or sheep lined pads as desired.

Tool and Safety Belts

Numbers given are "Klein's." These, or equivalents, recommended:

No. 5202 Tool Belt.
No. 5250 Safety Strap for above.
No. 5308 Safety and Jack Strap for pulling slack.

Tool Bags

20" heavy canvas with leather bottom.
Klein's No. 5102-20, or equivalent.

Pulley Blocks

(Light weight for pulling slack.)

Malleable iron, galvanized. Order in pairs as follows:
2¼" Shell double sheave, one eye.
2¼" Shell double sheave, two eyes.

Pliers

Numbers given are "Klein's." When other makes are desired, specify same, and state they are to be similar to following "Klein" numbers.

201—5 5" Side Cutting Diamond Pattern.
201—6 6" Side Cutting Diamond Pattern.
201—7 7" Side Cutting Diamond Pattern.
201—8 8" Side Cutting Diamond Pattern.
203—6 6" Long Nose, not side cutting.
202—5 5" Diagonal or oblique cutting.

Buffalo Grips

Klein's "Chicago" grip may be specified instead, equivalent to following Buffalo trade numbers. Smooth parallel jaw grips

of these types should be used on all bare line wire, *both iron and copper.*

Be sure to specify *with* or *without* pulleys. We recommend grips *with* pulleys built in.

No. 1 takes No. 6 B. & S. wire and smaller.
No. 2 takes 5/16" Strand and smaller.
No. 3 takes 7/16" Strand and smaller.

NOTE: For pulling strand we recommend Klein's trolley wire grip No. 1619-30 instead of the flat jaw Buffalo and Chicago grips.

Buffalo Linemen's Tool

With pin hook, strap, rollers and automatic lock.
No. 1 Extreme opening, 22", takes No. 6, B. & S. Wire and smaller.

Lag Screw and Nut Wrench

Klein's No. 3109-20, 13½" or equivalent.

Screw Drivers

"Yankee," or equivalent.
No. 90 Standard or Machinists' style, 4, 6, 8 and 10" Blade.
No. 95 Cabinet Style, Slim Blade, 6½, 8½ and 10½" Blade.
No. 15 Ratchet Style Slim Blade, 3 and 4" Blade.
No. 11 Rachet Style Heavy Blade, 6 and 8" Blade.
No. 30 Spiral Automatic double action with 3 Bits.

Terminal Nut Wrench

Klein's No. 3111-20 for ⅜, 5/8 and 7/16 Hex Nuts.

Torches and Fire Pots

Numbers given are Clayton Lambert. If another make is desired specify same and state equivalent to following C. L. numbers:

No. 32 Quart side torch with hook for soldering copper.
No. 38 Pint size torch with hook for soldering copper.
No. 1 Seven pint. Fire pot arranged to melt a pot of metal and heat soldering coppers at same time.

Digging Tools

8' Straight shovel with straight handle.
8' Flat toe spoon.
1 ⅛"x8' Steel crow and digging bar.
8' Iron shod wood tamping bar.
Iwan earth augers, 5, 6 and 8".
Regular earth augers, 5, 6 and 8".

Miscellaneous Tools

Such as saws, hammers, hand axes, etc., not pertaining strictly to telephone practice, can often be obtained from your local hardware store to better advantage than through your electrical jobber. Even though your local hardware man does not have the article in stock, you can select just what you want from his wholesale hardware catalog, and he can get it for you as promptly and at no higher cost than if picked up by your electrical jobber.

Making Telegraph Operators

Skilled knights of the telegraph key—plain, every-day telegraph operators, are scarce. There's only one way to supply the deficiency, and that is to make more telegraph operators. The making is not a matter of a day or a week, nor of a month. It requires several months, but the reward to the girl or boy who enters the list and tries for the making, is one commensurate with the application she or he will be called upon to put forth.

The Western Union Company has started a telegraphers' school, where there is now a daily attendance of many young people of both sexes. Most of these, however, are employed in other capacities by the company, and can only give a few hours a day to actual practice. What the company wants is an attendance of young folk—between sixteen and twenty-one years of age, a full eight hours a day. With conscientious application the matter of six months should see a bright student safely landed in a berth as a junior telegrapher, with the door opened to advancement and a salary within the matter of a few months, that will compare well up with the wages paid any skilled laborer in the country.

Things have changed since the old-time telegraphers knew the major telegraph company. Men whose ability demanded "top salary" of $75 a month ten years ago, now get $125 per month, for an eight-hour day. They get an annual two weeks' vacation with pay. They are eligible after a stipulated number of years of service, for the retired list with a life annuity or pension, equal to a big percentage of the salary they drew at the time of retirement. There were none of these things in force a decade ago. Had there been there would now be a number of men in the telegraph service who have sought other fields of endeavor.

The school for operators maintained in the company's offices runs the whole gamut. Not only is operation of the Morse system taught, but the multiplex or printing system as well. A visit to one of the schools found a dozen young men and women hard at work mastering the "touch" system on the typewriter-like transmitting machines of the multiplex, while some twenty or more were engaged in either learning to send or receive the dots and dashes which make up the Morse alphabet.

"The demand for operators is simply greater than the supply," said one chief operator. "We've just got to make additional telegraphers. Hence establishment of the 'school.' It is in charge of competent telegraphers and a number of apt pupils have been promoted to desks in the operating room within the matter of three to four months. Salaries paid beginners, of course, are gauged by their capabilities, and increases come rapidly in keeping with increased ability."

Spokane Company Distributes Books

More than 16,000 appeals to people of Spokane, Wash., for books and magazines for soldiers will be made by the Home Telephone Company, according to an announcement made by Manager C. E. Hickman.

Enclosed in each copy of the new telephone directory is a small slip of paper, upon which the appeal is printed. Spokane people are being urged to save magazines after they have read them and turn them over to George W. Fuller, city librarian.

The books and magazines can be left at any of the branch libraries or at the main library building. They will be collected when a sufficient number to make a wagon load is donated.

The Coast Defense System

The government is looking for several hundred experienced electricians to man what will be probably the longest telephone system in the United States. This system will be part of the means for coast protection. Wires will stretch from Eastport, Me., along the coast to the Rio Grande. The recruiting officers of the Coast Guard Service, who are in the United States Barge Office in Battery Park, New York, have received orders to recruit the men at once.

The men enlisted will be rated as acting electricians, and their pay will be $72 a month, with $10 monthly for quarters and 45 cents a day for rations. To be accepted, applicants must be practical telephone men, with experience in the construction and maintenance of telephone systems. They will be required to furnish testimonials of experiences. The term of enlistment will be one year.

The recruiting officers of the Coast Guard have been instructed also to obtain a number of young men ambitious to become radio operators. Young men with high school or academic education, between the ages of eighteen and twenty-four, are desired, and will be sent to the Coast Guard Academy at Fort Trumbull, New London, Conn., for training.

The Independent and Bell systems at Warren, Ohio, have merged.

Four and One-Half Per Cent

An Explanation of the Familiar Bell Exaction from Subsidiary Companies

BY W. N. FURTHMAN

IN attempting to throw new light on the legality of the family tree of the American Telephone & Telegraph Company any reliable authority on the subject might be undertaking a difficult and probably a fruitless task, if he followed the beaten path.

It is not the purpose of this article therefore to endeavor to show a result dependent on a resume of old arguments and an analysis of ancient statistics. It is rather the purpose of the writer to approach the proposition from a new angle: namely, from an engineering point of view. Since every act of the A. T. & T. Co. may be said to be pregnant with engineering approval, it is thought some light may be cast into a darkness of legal terms under which it is at present successfully hidden.

In courts of equity, before all of the state utility commissions, under the microscope of U. S. Government investigation, and quizzed by experts for all of our large municipalities, the problem has stalked in and out practically unsolved and with only slight results as a benefit in rates to the public at large. No one can deny the coinage of another attempt, and failure will only be another melted pebble of hail in a mighty storm. A successful effort would mean a golden fleece, as a matter of proper rates to the people everywhere.

There are many mysteries in the world of finance, and naturally the A. T. & T. Co. has more than its share. Since the biggest mystery of all has been before the Interstate Commerce Commission since the year 1915, and no comment from that august body has ever reached the wondering and patient public, surely the writer cannot be expected to stalk that ghost.

So it will be seen that even the new attempt must dodge the short cut of the first bridge and take the long, dusty road of facts.

In studying the organization of the engineering department of the Western Electric Company and the functions it performs, it will be noted that the three principal branches of the organization are original development division, research division, and automatic development division. The remaining three large subdivisions are laboratory, design and factory engineering divisions at Hawthorne.

One of the principal reasons why the Western Electric engineering department is located at New York, and why it was completely transferred from Hawthorne, Chicago, in 1907, was to bring it in the closest possible touch with the executives of the A. T. & T. Co. An examination of the organization plan shows that the engineering department of the Western Electric Company should be fully and ably equipped to solve and perform not only any manufacturing problem, but also any operating proposition that might be submitted to it for solution and action.

Why, therefore, are not operating as well as manufacturing problems solved by this department for the subsidiary companies? Why is it necessary for the A. T. & T. Co. to maintain another general staff of engineers under its own name? It may be somewhat surprising to some to receive the direct answer that, "it does both" to the first question, and "it does not" to the second. Why then should the A. T. & T. Co. receive 4½ per cent of the gross receipts of the subsidiary companies all over the country instead of the Western Electric Company?

The most simple answer should be that "it should not," and especially so because the Western Electric Company has already levied an engineering tax of 3 per cent on every piece of apparatus and coil it sells to these same subsidiary companies. Every estimate that is made by the cost department of the Western Electric Company includes a loading of 3 per cent for engineering services by that branch of the engineering staff of the Western Electric Company. No price on any apparatus that is made would be official without this loading. What service then is performed by the A. T. & T. Co. so-called general staff that is not or could not be performed by the so-called general staff of the Western Electric Company? The answer is, there is none, because the only real and now fully equipped general staff belongs and is assigned to duty and paid by the Western Electric Company. We have then a levy of tax of rental and services that is 7½ per cent instead of 4½ per cent. Simple addition of 3 per cent and 4½ per cent proves this statement. It only remains then to prove that the 3 per cent charged by the Western Electric Company is not a part of the 4½ per cent charged by the A. T. & T. Co.

The best method of proving any problem, no matter how complex, is to be at both ends of it. The writer has been in both positions. As a member of the engineering staff of the Western Electric Company he has been required to report and assign his time and expense to specific order numbers to justify the actual charging of engineering expense. Further, he has been instructed to require those reporting to him to do likewise.

Now for the other end. All subsidiary companies of the A. T. & T. Co. have contracts with the A. T. & T. Co. and the Western Electric Company. Space would not permit the reproduction of both these voluminous contracts—hardly one of them. It will suffice to state that the one mentions specific services to earn 4½ per cent of the gross receipts and the other describes every other service but engineering service at many and varied percentages, but in no case is gross receipts described. In other words, the A. T. & T. Co. contract does not include any charges for services that are included in the contract of the Western Electric Company. To do so would be crude, and self indictment.

In a recent rate case before the Illinois Utility Commission, the writer endeavored to show, and give credit to the Western Electric Company, for certain engineering feats on behalf of subsidiary companies it had performed, in connection with loading coils and transcontinental service. He regrets very much to be obliged to record that the A. T. & T. Co. counsel refused to tread on thin ice and would not question the witness on this phase of the rate case.

In other words, the Western Electric Company must always be a silent part of the A. T. & T. Co. plan and any work its engineers may do must be hid under a bushel; and it is because of this injustice that some good

may be accomplished by this article. The records of every rate case show conclusively that the engineers of the Western Electric Company are never called upon for assistance. In the Central Union Telephone Company minority stockholders case, not an engineer of the Western Electric Company was called although it could be constantly shown that the ship was gradually sinking to defeat. It seems to have been the decision of the captain in charge that the engineers of the Western Electric Company might do the 4½ per cent charge of the A. T. & T. Co. harm, although they might do some good in explaining the high prices of the Western Electric Company as charged to the subsidiary companies.

This continuous absence of Western Electric engineers in every case seems to the writer to be the best proof in the world of the contention which is here made, that the engineers of the Western Electric Company know how to do and are doing many things the A. T. & T. Co. does not want to be made public.

Provided it is true that the engineers of the Western Electric Company earn all of that part of the services included in the payment of 4½ per cent by the subsidiaries to the A. T. & T. Co., it will be immediately clear that no court or commission has heard all of the necessary evidence to warrant a fair and impartial decision. It may seem somewhat radical thus to belittle all of the records, but it seems fundamental that no problem can be solved wherein at least one-half of such a problem has been overlooked or cast aside. Surely the problem warranted the fullest investigation of every condition and circumstance. Most assuredly this body of trained engineers as represented in the chart are a substantial part of any question in which they may appear. The upkeep cost of such an organization is easily over one million per year. Then it must be a circumstance and a condition in any payment for service to the A. T. & T. Co.

Why, then, are the engineers of the Western Electric Company so badly neglected in this live, big issue of rates?

Why are they referred to as office boys, expense employees, treading soldiers without a country, elephantine in size, but pussy-footers in deeds and actions that are anywhere near worthwhile?

The answer to the former question is that the ruling policy of the A. T. & T. Co. has decided they must have a clearing house of engineers and the subsidiaries must pay for that service. Every manufacturer in the Independent field boosts and boots his engineering department and he advertises the service is free for the asking. Pick up a Western Electric Company catalog and you will note that in fighting for Independent business it also agrees to give engineering service free of charge. There is consistency, or rank inconsistency, depending on your viewpoint.

Now another pertinent factor on the question of service is this: Every bulletin, plan, specification, or any other service whatsoever rendered by the A. T. & T. Co. to its subsidiaries is positively duplicated by the Western Electric Company in its service to its Independent patrons.

Since the Western Electric Company gives through its engineering department to its Independent patrons every possible service free of charge, why should it not be more than willing to give the same service free of charge to Bell subsidiaries? Why, says the A. T. & T. Co., they are not capable of doing so. The Western Electric Company engineers do not understand the operating end of the telephone business; as a matter of fact, they are not supposed to know.

Another thing, they go on to say, the operating engineers do not know anything of manufacturing problems. Both of these units must come to us, a third unit—who know everything about operating and manufacturing. We will take them by the hand and show them how to play together. Now let it be stated right here, as a matter of fact, that not one engineer of the A. T. & T. Co., in all of its existence, ever had any practical experience in the manufacturing end of the telephone business, especially so in the plant of the Western Electric Company. On the other hand, with only one or two exceptions every engineer of any value to the Western Electric Company has had operating experience, either in the Bell system or Independent field.

If this is true, then what good reason is there why the engineers of the Western Electric Company should not do business direct with the engineers of the operating companies? The answer is very simple indeed. They are doing business direct with the operating engineers by telephone, telegraph, cable and mail, and always have.

Previous to the year 1906 this connection between the operating engineers and the engineers of the Western Electric Company was as close and intimate as any relation of the kind could bring about.

Previous to the expiration of all good fundamental patents the rental fees for equipment made service charges ambiguous and unnecessary. But after they expired some method must be found to continue the golden flow from the subsidiaries. Without patents only service remained and unfortunately the word service from a legal standpoint is some "word," and covers a multitude of sins. As they started in to use this word service, its power became known more fully—and it was not overdone, either, simply because it could never be overdone.

About the year 1906 somebody discovered that engineers of the Western Electric Company were giving their services free of charge to the operating engineers of the operating companies. This condition would never do at all. It would knock the whole plan into a cocked hat in any court of equity; so it was stopped in this way:

In the future all letters should be sent to the A. T. & T. Co., both operating to manufacturing and vice versa. They were prepared fully, however, by the sending party. They were then re-written and sent out on A. T. & T. Co. letterheads and signed by the chief engineer of that company. The engineers of the Western Electric Company received an official copy of this letter as a check on its contents and so did the engineer of the operating company.

So the clearing house was established. It is almost beyond belief that letters for the engineers of the Chicago and Central Union companies must go to New York before they could reach Hawthorne in Chicago. Such, however, is the exact fact. So it will not be wondered at that the telephones between the Chicago offices and the factory were used to capacity all day as an underground means of avoiding the censor.

When one stops to consider that the operating or manufacturing engineers could not agree to change the screw in a bolt or a thread in a nut, a sane man can hardly believe his eyesight. The writer never would believe that even the censor and rigid discipline could maintain this regulation; but it was and is done to this day.

When an operating engineer desires to realign or develop a new method or design, he compiles the proposition in a brief with sketches and forwards the proposition to the A. T. & T. Co. engineers. Then it is forwarded to the engineers of the Western Electric Company. The same procedure is followed when the engi-

neers of the Western Electric Company have a design or method they desire to propose. The case proposed by the Western Electric Company, however, is always sent to every large telephone company in the country for approval or criticism. These opinions obtained by the engineers of the subsidiaries are then returned to the Western Electric Company as received by the A. T. & T. Co. Conferences are held by the engineers of the A. T. & T. Co., and the engineers of the Western Electric Company, and then the latter do all the work until the case is completed.

There is one point that must be made right here, in entering this statement of fact. Few, very few, suggestions, designs, developments or other ideas are offered by the operating engineers to affect the manufacturing field of effort covered by the engineers of the Western Electric Company. On the other hand, however, voluminous ideas, designs, methods, and development plans are offered and accepted by the operating companies as suggested and proposed by the engineers of the Western Electric Company.

The writer was in direct charge for five years of a very important work for the Western Electric Company, namely, loading coils and cable, and it was necessary for him to keep in close touch with every development or design case that was carried on. It can therefore be stated as a fact that ever 90 per cent of the work caried on by the engineers of the Western Electric Company originates in its own department.

It is contended that this is the logical place for the engineering work of both the operating and manufacturing fields to originate and that it is impossible for it to originate in any other department. This is particularly true as a matter of engineering and the patents issued in the name of the Western Electric Company and the A. T. & T. Co. proved this contention.

In the design of telephone apparatus, equipment and cable, the two general problems considered are operating and manufacturing. In design work it is necessary to consider not only the fundamental principles it is desired to cover, but also to have in mind operating requirements as well as the manufacturing features that are necessarily very essential. It is very difficult for the writer to conceive of any design work being carried on by the operating engineers or the engineers of the A. T. & T. Co.; first, because they are not equipped with all of the requirements of a design engineering department—and the chart of organization will prove this—and second, they are not in touch with the manufacturing department. A new development, design, or re-design of telephone apparatus, equipment and cable is brought about either because of a desire to improve operating conditions, or to improve the design either from an electrical, mechanical or manufacturing standpoint, or because of either one of these conditions or all of them.

In any case of design it will be clear that after the operating conditions and problems have been determined it then becomes essential that cost and price are very important factors. The operating engineers could not have any information on manufacturing cost or price, nor could the engineers of the A. T. & T. Co., except as it was obtained through the engineers of the Western Electric Company. It will be evident that the A. T. & T. Co. could not have any knowledge of conditions in different parts of the country such as climate, high potential conditions, building laws and conduit ordinances, except through the operating engineers of the company in that particular section of the country. So it will be seen that the A. T. & T. Co. obtains its engineering information from both the operating and Western Electric engineers.

What service, therefore, does the A. T. & T. Co. render that could not be rendered by either the engineers of the operating companies or of the Western Electric engineers?

None whatever except from a consulting basis. Provided two engineers are necessary, one from an operating and the other from a manufacturing viewpoint, it will be clear that the benefit of a third engineer is of value only as three heads are better than two.

As a matter of emphasis it can be stated here that the A. T. & T. Co. does not deny that the operating companies and the Western Electric Company have large and expensive engineering departments. It simply sets up that neither one of these could perform satisfactorily without the A. T. & T. Co. engineering department.

The writer does not know of any better evidence than that of patents as to the matter of originality. No question of merit pertaining to engineering can withstand the attack of originality. In the Central Union minority case the A. T. & T. Co. ran into this phase of the engineering service question head on. How did she meet the issue? Simply by introducing all of her patents in evidence, and setting up that they were invented by her engineers. Think of it, kind readers—and over ninety per cent of the inventors listed in the bulletin were Western Electric Company engineers, five per cent were engineers not in the A. T. & T. Co. family tree, and the balance of five per cent the A. T. & T. Co. had a right to claim as its very own—*and only that last five per cent!*

The writer does not contend that the engineers of the Western Electric Company are not A. T. & T. Co. engineers. They are, without any question whatever. It is only contended that a charge of 3 per cent for their service is made against every piece of material it produces. In other words, the operating companies have paid the price in cost and should not *again* pay for it *as service.*

Now let us examine another phase of the matter. Do the engineers of the operating companies render any service to the engineers of the A. T. & T. Co.? Most certainly they do.

Do they receive any compensation from the A. T. & T. Co.? Not one cent.

What services do they render? They render many services, requiring plenty of hard work and also of very great value.

How is this proven? The best method known to the writer is by a close examination of the so-called bulletins issued by the A. T. & T. Co. and forwarded to the operating companies.

These bulletins admit the important services rendered by the operating companies and go on to ask for more.

Can the whole matter be explained by the proper examination of these bulletins? Yes, most certainly, and then some. Why? Because the circular letters attached to the bulletins admit that the A. T. & T. Co. does not write a bulletin without asking service of the operating company and also its approval and then of its brothers and sisters in the happy family. Think of it—and then it makes them pay for giving the service and rendering the approval! Provided they are not escaping with almost a whole hide the proposition would be farcical, ridiculous, almost beyond belief.

The engineering services of the A. T. & T. Co. are as unnecessary as the toll service it renders to the operating companies. Why? Because it is duplication and

runs in parallel with service and lines rendered and operated by the operating companies.

Think over that word "duplication." What in the name of all reason and sense is meant by that word? Ask the A. T. & T. Co. They have torn it to atoms. Why? To kill competition.

Still we find that the payment of 4½ per cent of the gross receipts is duplication. It was positively proven in the Central Union minority case that the A. T. & T. Co. lines ran in parallel to the Central Union and that the Central Union transferred the call to the A. T. & T. Co. so they would not be duplicated. Can you beat that word duplication? Not a bit of it.

Provided we live long enough we may see the day when it stages a comeback for all of the abuse it has taken against its will.

Now take that toll proposition a little further and ask this bold, bad question of *lese majeste:* Are the A. T. & T. Co. toll lines necessary? No, sir. Why? Because the lines of the operating companies not only connect with each other but they overlap. How do you know? Would you believe, when I say the Southwestern Tel. & Tel. Co. lines are projected into Illinois from Texas? Absolutely. See the records of the Utility Commission. And the lines of the Missouri Bell Telephone Company are right next door.

The problem seems kind of complex, but as a matter of fact, is it? Why do we need the duplication of the A. T. & T. Co. toll lines, provided the lines of the subsidiaries connect, jointly and overlapping?

It is not necessary in a railroad, because in railroad work it has not yet been found necessary. So it is unnecessary for the same reason in the telephone field.

So it will be seen that the service the A. T. & T. Co. renders from an engineering standpoint is not only duplication but the toll service it renders has been termed duplication. Judge Dever in the Central Union case went even further—he termed it unfair competition. In arriving at this decision Judge Dever was no doubt very much impressed with the bulletins on long distance toll lines and the loading coils that are used on such lines.

Among other problems this bulletin points out that provided the operating companies do not transpose their lines, or re-transpose them, to conform to loading principles they cannot be loaded. Just think that over. Provided the operating companies do not do some very expensive work for the A. T. & T. Co., the latter cannot give the service it is going to charge them for anyway.

This is the most typical of cases on this question of service. To obtain the service the operating companies must so perform that the service can be of value.

Now we find that transposing is not necessary for loading a telephone circuit. In other words the work required to obtain the service was not necessary from an engineering, long distance or operating standpoint.

As a conclusion it is almost impossible to pick out a better example than this: A careful examination of the bulletins will show they are reissued and reissued four and five times each, and the reasons therefore are given in the new bulletin in plain terms—in most instances because the Western Electric Company or the operating companies found they were not practical from a manufacturing point of view, or because they were objected to as an operating proposition.

As a clearing house there can be no question that the A. T. & T. Co. performs a service—provided, however, that such service is worth 4½ per cent of the gross receipts of the operating companies. The bulletins will show the A. T. & T. Co. also receives valuable service and information.

In the opinion of the writer, the value of such service and information is greater than the service the A. T. & T. Co. renders as a clearing house.

Another part of the 4½ per cent service is rental of instruments, receiver, transmitter and loading coils. Why rental? The patents have expired. They sell to Independents, why rent to subsidiaries?

The instruments are exactly the same. Tests will prove it, provided it is for any reason denied.

In this instance also the bulletins will shed light. They show that the Western Electric Company repairs the instruments. They also point out to the operating companies that by following certain rules and regulations devised by the Western Electric Company it would be mighty handy for the operating companies to do their own repairing. Why rental? Why not buy and save money?

If the true state of facts is desired, no municipality or utility commission should fail to look into those A. T. & T. Co. bulletins. They are mighty good evidence as a boomerang, because they show the Western Electric engineers are not pusy-footers.

The Trouble Shooteress

She was young, pretty and chic looking, says the Logansport, Indiana, *Tribune.* She tripped into our office and in a voice as distinctly feminine as her appearance, demanded a step ladder. "Why—er, this is a newspaper office you know," the bookkeeper informed her and then anxious to be of assistance to so charming a lady vouchsafed the information that there was a hardware store to be found in the next block.

But the lady never stopped to argue. She flitted right through the office and back through the reportorial rooms and into the sanctuary of the telegraph operator. There she immediately busied herself with wires and fuses and only glanced up to repeat to the bookkeeper, and all the rest of the office force, who had followed, her request for a step-ladder.

The step-ladder was forthcoming and after adjusting it to her satisfaction she calmly ascended the step-ladder and in a very efficient fashion began to examine a connection. As she worked she mumbled an explanation which sounded like "grounded wire—trouble on the circuit—must be in this office."

Anyway, she located the trouble and adjusted it very neatly and descended the ladder. She directed some of her attention to the Bell telephone and finally, apparently satisfied, flitted out as she came in, plus a pair of very grimy hands.

She is Miss Bema Singer and her position is—according to her—"nothing special, just anything." She is in charge of the local branch of the Bell Telephone Company. She explained her activities yesterday by saying that just at present she didn't have a lineman handy so she just fixed things up a bit herself.

In this day when women are doing the most amazing sort of work—men's work—and doing it efficiently, one should not be surprised at anything—and yet it was a surprise—she wore such a pretty green embroidered linen frock and her white Milan hat, ornamented with big white wings, was so feminine looking. And the last thing she said to a too inquisitive reporter was, "don't you dare write me up in the paper."

Photographs by Cable

How the Korn Telegraphic Process is Extended to Submarine Transmissions—From the Scientific American

SOLVING the problem of tele-vision has long been one of the outstanding dreams of the inventor. What the telephone is to the ear, the tele-vision apparatus would be to the eye—a means of bridging space and receiving sense impressions from practically unlimited distances. Just as the voices of those connected by telephone are audible to one another, so anything passing at the end of the tele-vision line would be visible at the other end.

While we are as yet far removed from the solution of this problem, another task of similar nature which likewise appeals in an uncommon degree to the human mind has been solved of late years. Telegraphic transmission of photographs, handwriting, drawings, etc., has reached a point where, until war interrupted international traffic and took over control of the world's telegraph and telephone lines, some of the foremost European papers made a feature of the publication of photographs received by wire.

The question now arises as to whether what has been done on overland telegraph lines could not also be achieved over cable lines. The advantages thus obtained would, of course, be incomparably greater than in the case of the ordinary telegraph, on account of the much greater saving of time insured by cable transmission. And the problem, it seems, approaches solution at the hands of Professor Arthur Korn, the inventor of the photo-telegraphic process just referred to; all that is lacking, in fact, is the cable facilities for an actual working test of his method. That this lack has not embarrassed Professor Korn in his work is due to the fact that the picture to be transmitted is to cross the ocean in the form of a plain cablegram consisting of many thousands of letters, each corresponding to the light qualities of a given element of the picture. All questions connected with the problem could, therefore, be solved in the absence of cable lines, since the role of those lines in the process was a standard one.

It has been the present writer's good fortune recently to inspect Professor Korn's apparatus in his laboratory at Charlotburg, near Berlin. He is, therefore, in a position to explain to the readers of the *Scientific American*, in the first account of this process published on the western side of the ocean, how the mysterious cablegram above referred to is obtained, and how it is reconverted into a picture.

In its first stages, the new process is practically identical with Professor Korn's photo-telegraphic process for overland transmission, based upon the remarkable property possessed by selenium of undergoing variations in electric conductivity under the influence of variable illumination. A translucent film of the picture to be transmitted is wound upon the outside of a glass cylinder which, by an electric motor, is set rotating about its axis, while slowly advancing in the direction of this axis—a motion precisely that of the cylindrical phonograph record. Each point on the circumference thus describes a helicoidal line, so that the beams from a Nernst lamp (a type distinguished by its extraordinarily constant candle-power) which are thrown by a lens system upon a point of the cylinder, successively light up every point-element of the picture—again following the analogy of the phonograph, where the needle passes successively over all points of the record.

A photograph received over the cable in two sections

In the interior of the cylinder is placed a selenium cell. This is struck by the beams from the lamp, after their passage through the film. The darker the picture at any given point, the less light penetrates at that point to fall upon the selenium cell—and vice versa. At the bright places the beams pass through with practically no diminution of intensity, while the dark portions arrest them more or less completely, and intermediate shades produce an absorption inversely proportional to their intensity. Under the influence of this varying illumination the selenium cell varies in electric conductivity and the current intensity in the circuit fluctuates accordingly.

In the case of ordinary photo-telegraphy, these current fluctuations are reconverted at the receiving station into fluctuations of light, the process above described being, as it were, repeated in reverse order. These fluctuations of light, eventually fixed photographically, reproduce the original picture.

Inasmuch as this cannot be done in the case of a cable line, because of its very low powers of effective current transmission, the current fluctuations corresponding to the variations in shading of the picture, instead of being put directly upon the outgoing wire, are reconverted into what Professor Korn calls an intermediary cliché in the form of a letter cablegram. From this, transmitted in the ordinary course to the other end, the original picture can be reconstructed at any moment. Moreover, a further demand upon the inventor's ingenuity arises from the fact that the current flowing through the circuit containing the selenium cell, necessarily feeble in order not to exceed the capacity of that cell, are unable to perform any mechanical work worth speaking of. They are, therefore, made to switch in stronger currents through the agency of a cleverly designed relay.

The feeble currents pass through an extremely sensitive moving-coil galvanometer, the needle of which undergoes deflection in accordance with their actual intensities. The deflected needle, which is of non-conducting material, but carries at its ends small metal pins, passes on both sides below metallic sectors communicating with a source of Tesla currents and above a series of contacts, each connected with one of a series of circuits. As the needle is deflected into a position bringing its ends above a given one of these contacts, Tesla sparks will pass, thus allowing an alternating current to flow between the ends of a spark gap in the corresponding

circuit. This circuit, since an electric arc to all intents and purposes acts like an electric conductor, is then closed, and a direct current of the appropriate intensity can pass through. The several circuits are connected with a high-speed telegraph, in the perforated tape of which, through the agency of a polarized relay, the current thus flowing produces a given combination of holes. The valuable feature in connection with this arrangement, and one which would seem to admit of a multitude of other applications, is the absence of any friction worth speaking of, current closure being produced by arcs and Tesla sparks rather than by actual contacts.

From the above it will be understood that each combination of holes in the tape of the high-speed telegraph corresponds to a given deflection of the galvanometer needle and, through this, to a certain current intensity in the selenium current and to a certain shading in a given point of the picture, which can thus be said to have been converted, point by point, into a series of perforations of the tape. This, however, in the high-speed telegraph, can be in its turn translated into a series of letters, each corresponding to one element of the original picture.

An ordinary portrait is decomposed into 10,000 to 20,000 elements, other pictures into more, in accordance with the actual wealth of detail. Professor Korn uses fourteen Tesla circuits, and as each of these corresponds to a given light shading, on the one hand, and on the other to a given combination and a given letter, his scale recognizes the existence of fourteen different shadings in the make-up of a picture.

There are different possibilities for reconstructing the original picture out of the letter cablegram transmitted in the usual way. One course which has been tried and which, if perfected, bids fair to yield excellent results, consists in reproducing the picture by aid of the inventor's photo-telegraphic receiver, the cablegram being automatically reconverted into a series of perforations by well-known means. In a more or less general way, this involves the duplication, in reverse order, of the series of operations employed in passing from the original picture to the perforated tape.

Another possibility, much simpler and requiring far less expensive apparatus, consists in copying the cablegrams out on a special typewriter. The latter will comprise as many keys as there are shades in the scale, in the present instance fourteen. Its type bars carry, in the place of standard type characters, small squares or circles corresponding in size to the area of the elements into which the picture is decomposed, and are so adjusted that the intensity with which each print corresponds to the shading expressed by the letter in question. The latter, of course, appears on the face of the key, so that translation is wholly automatic. By copying off on this machine one letter after another of the cablegram, the original picture is reproduced point by point and line by line. The letter X is employed to indicate the end of the line.

Greater speed and more uniform results can be obtained by operating the typewriter with the aid of electric power. The speed of operation is further increased by subdividing the picture into several sections, to be copied by different typists. As neighboring elements seldom vary abruptly, the mechanical nature of the work may be greatly increased by adopting various code letters for combinations, repetitions, etc. It is pointed out that this typewriter scheme, new in itself, is equally applicable to the ordinary photo-telegraphic technique. Moreover, the entire process as here outlined seems available for radio-telegraphic transmission of photographs.

Virginia-Tennessee Merger

A telephone merger affecting a large section of Southwest Virginia and East Tennessee has been effected within the past few days. The Chesapeake and Potomac Telephone Company, the Bristol Telephone Company and the Cumberland have been operating lines in the same territory, embracing Bristol, Johnson City and Kingsport, in Tennessee, and the counties of Washington and Russell in Virginia. This has been confusing and inconvenient to the people served by the lines, and the merger was formed with a view to remedying the trouble.

For a year the Interstate Commerce Commission has had the question of the merger under consideration, and recently gave its consent for the arrangement to be effected. The telephone companies then acted promptly.

The territory covered by the merger will be formed into a new system, with a plant, modern in all its details, in Bristol. A company will be formed, officers elected and arrangements made to give an up-to-date service. Some contiguous territory, covered by independent lines, will probably be taken in by the company, Scott county being embraced in this.

The merger applies only to the territory in which two or more of the above companies have been operating.

Camp Hancock Well Served

Three public corporations at Augusta, Ga., are planning to give the government the best service possible at Camp Hancock.

M. C. Welsh, district construction foreman of the Postal Telegraph Company, is in Augusta to decide which is the best of three proposed routes to get wires into the camp, and to have them ready for service when the soldiers arrive.

G. A. Alexander, of the Western Union Telegraph Company, is also in the city to plan the route for the Western Union to get to the camp with its wires.

The Southern Bell Telephone Company is working on its line to the camp, in fact, already has four telephones at the camp. The government will have a private exchange at the camp, but the Bell will run about twenty-five or thirty trunk lines to the camp. The government will install telephones when the soldiers arrive. It is planned, also to have about forty pay stations at the camp in addition to the wires to the government exchange. The wires to the different points in the camp will be put in by the signal corps, when they arrive, the telephone company putting in the trunk lines and the lines for the pay stations.

It is planned by the three companies to have these wires into the camp when the men arrive, that there will be no delay in service over any one of them.

Fakers Use Telephone

"This telephoning business by the financial fakers instead of the use of the mails, which are closely watched by postal inspectors, is expanding," says the financial editor of the New York *Sun*, "and today we have a circular from a self-styled banker who says he is so anxious to make money for us that we must give him our telephone number so that he may be in touch with us day and night, as at all hours of the day and night he has important news to send us. In other words, he wants one to keep one's ears locked to the telephone for the advice which will make millionaires out of paupers. Persons who receive this circular should forget it."

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

WITH the ever increasing distance bridged by the telephone, the distances between telephone subscriber and telephone exchange, especially when considering the long distance service, become larger and larger. The result has been a very unwelcome increase of damping effect. For example, it may happen that a subscriber talking over long distance from his home, which may be in a suburb and quite a distance away from the long distance exchange switchboard, has difficulty in carrying on a conversation, while another subscriber, living nearer to the exchange, can communicate without trouble over the same long distance wire. The increase in the lamping effect rests partly on the increase in the damping exponent of the subscriber's telephone cable, which increases with the length. But the resistance also increases with the length of the cable and the relative influence of the fluctuations in resistance in the microphone on the total resistance of the subscriber circuit becomes smaller and smaller. We of course presuppose the use of the common battery system which is used in modern telephone work. The result is a decrease in amplitude of the alternating current acting in conjunction with the direct current, and this naturally means a decrease of the initial current which passes into the telephone line.

In order to eliminate these difficulties, the subscriber cable ought to be shortened, i. e., the long distance line should be brought closer to the subscriber by transferring the microphone battery current supply from the long distance exchange to the local exchange. At the same time the interoffice trunk lines must be brought to an efficiency and capacity which shall be at least approximately equal to that of the long distance line. Here there is a fundamental difference between European and American practice, for with us in America we supply the microphone current not from the long distance station but from the local exchange. The inter office trunk cables are slightly pupinized in order to decrease the damping effect and to bring them as near to the characteristic of the long distance lines as is possible. When speaking over very long distances, it is frequently found expedient to double the voltage of the feed batteries. It is also possible to achieve the same results by pupinizing the telephone cables between long distance exchange and local exchange.

In order to find out experimentally what improvement in service can be obtained by the transfer of the microphone current supply from the long distance to the local exchange and pupinizing the interoffice trunk cables, a series of tests was made some time ago at the Imperial Testing Stations. The influence of the battery voltage was also examined.

For subscribers and office trunk cables ordinary paper insulated long distance cables were used with 0.8 mm. conductors. The interoffice trunk cable was provided with Pupin coils. For long distance wires, carefully calibrated and tested telephone conductors were employed, which were connected so as to represent various conditions of service;

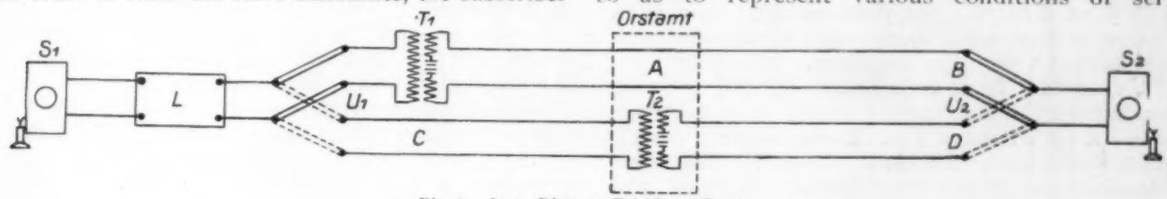


Fig. 1. Long Distance Telephone Tests.

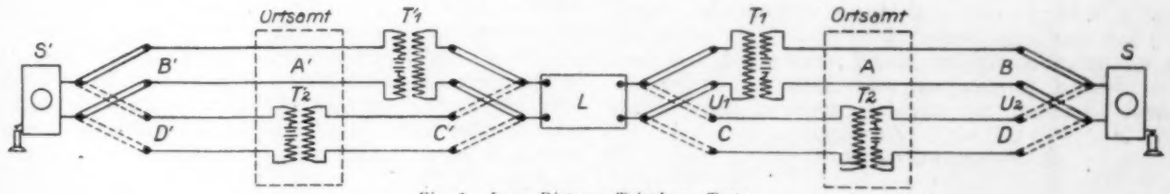


Fig. 2. Long Distance Telephone Tests.

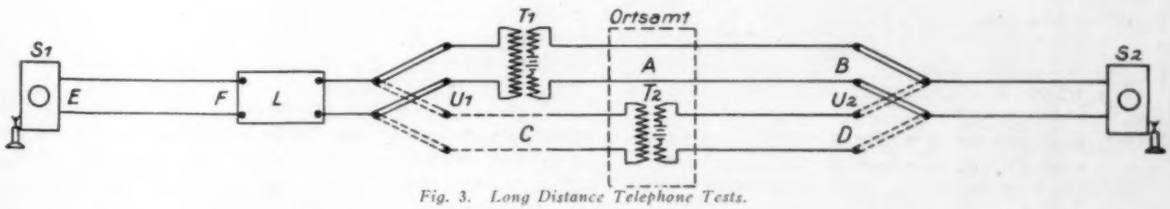


Fig. 3. Long Distance Telephone Tests.

a pupinized line with a characteristic of Z=2,000 ohm, an ordinary overhead line, or else an ordinary cable without any increased self induction. The results of the experiments, aside from the discussion, have been compiled in tabular form for the sake of convenience. In these tables reference is made to the figures of the wiring diagrams, for aid to easier study.

A.—Change of Current Supply on One Side:—In order to obtain a simpler condition at first, the tests were made for the first series, so that the changes of current supply took place on one side of the connection only, while the other side remained as before. Fig. 1 shows the diagram, in which L = the test line, S_1 = local battery wall set, S_2 = common battery wall set, U_1 and U_2 = two-pole switch, T_1 = repeater to the long distance exchange, T_2 = repeater to the local exchange, T_1A or CT_2 = interoffice trunk cables, AB or T_2D = subscribers' cables.

The one side of the long distance line (L), which here consisted of a Pupin line of 2,000 ohm characteristic, had the subscriber's telephone connected, the latter an ordinaray local battery wall set S_1. This was connected directly and permanently. On the other side was a two-pole switch U_1. In practical operation the long distance exchange would lie at this spot. A second switch U_2 was in front of the other subscriber's telephone set S_2, which, however, was a common battery wall set. By simultaneous use of both switches one could talk either by way of the long distance repeater T_1, the interoffice cable T_1A and the subscriber's cable AB, or else over the interoffice cable CT_2, the repeater T_2 at the local exchange and the subscriber's cable T_2D. In the first case the office trunk represents a lengthening of the subscriber's cable. In both cases the total lengths of interoffice cables and subscribers' cables were equal. When the office trunk cable CT was pupinized, its characteristic was 2,000 ohm. Both repeaters were of the same type and were fed with the same voltage, 24 volts.

The damping exponent of the test line L was changeable in steps of 0.5, namely $\beta\iota = 2$, to 2, 5, etc., up to 4.5. In general the tests were made with a damping exponent of $\beta\iota = 2$ for the long distance line. In various cases conversational experiments were made even with changed values of damping exponent. The results remained the same. If one talked over T_1, then the long distance line with the connected cables gave a certain definite value of telephone conversation, i. e., a certain loudness and clearness of sound. When speaking over T_2 conversation was better under certain conditions, and the damping exponent of the test line L had to be increased, in order to obtain the same strength of sound over T_2 as was experienced over T_1. This value of change in the calibrated test line L, expressed in values $\beta\iota$, is considered as standard measurement for the improvement obtained. As the improvement did not always give a multiple of the steps $\beta\iota = 0.5$, the values were limited and averaged. In order to make the experiments more in conformity with actual practice, the tests were limited to fairly long cables connecting to the subscribers' lines. Table I gives the results obtained with lengths ranging from 5.4 to 9 miles.

TABLE I.

	Conversation into Telephone	Conversation compared alternately over T_1 and T_2	Conversation over T_2 (current supply from local exchange) louder than over T_1 (current supply from long dist. exchange) by:
		All cables unpupinized T_1 B=5.4 miles C T_2=3.6 miles T_2 D=1.8 miles	
1a	S_2		$B\iota$=0.2
1b	S_1	Same	$B\iota$=0
		T_1 B=5.4 miles C T_2=3.6 miles T_2 D=1.8 miles	
1c	S_2		$B\iota$=0.5
1d	S_1	Same	A little, hardly noticeable
		All cables unpupinized T_1 B=9 miles C T_2=7.2 miles T_2 D=1.8 miles	
2a	S_2		$B\iota$=0.5
2b	S_1	Same	$B\iota$=0
		T_1 B=9 miles C T_2=7.2 miles T_2 D=1.8 miles	
2c	S_2		$B\iota$=1.5
2d	S_1	Same	$B\iota$=0.5
		T_1 B=9 miles C T_2=6 miles T_2 D=3 miles	
3a	S_2		$B\iota$=0.2 to 0.3

The experiments 1*a*, 2*a* and 3*a*, in which conversation was carried on at S_2, show that the mere change of the current supply from the long distance to the local exchange brings an improvement in conversation. This improvement is really effective only with fairly large cable lengths, figured between subscriber and long distance exchange. If along with the transfer of current source the interoffice cable is pupinized, then the improvement is considerable. Tests 1*c* and 2*c* show that to be the case.

The transfer of current supply to the local exchange without simultaneous pupinizing of the office trunk cable brings merely an improvement of communication in the one direction, i. e., when talking into S_2, in other words the subscriber at S_1 benefits. The other direction does not benefit and the subscriber at S_2 has just as much difficulty as before. Tests 1*b* and 2*b* show that. On the other hand pupinizing of the interoffice cables brings an advantage for the second direction of conversation, i. e., when speaking into S_1; in other words, the subscriber listening at S_2 now benefits as well. Pupinizing the interoffice cable decreases the damping exponent of this section of line, which results in an improvement in conversation in both directions. To this effect is then added the one sided effect due to the transfer of microphone current supply from the long distance to the local exchange.

Influence of Battery Voltage: The influence of the battery voltage could be investigated by having the line in Fig. 1 permanently connected over T_1A and changing the voltage of the battery for T_1. The conversational tests were arranged so that the voltage of 24 volts was always used as standard. The voltages were increased to 36, 48 and 72 volts. When using a subscriber's line of 3.6 miles length no improvement was noticed even when using 72-volt battery as against the original 24-volt battery. A subscriber's line of 9 miles length gave no improvement with a 36-volt battery either. When using 48 and 72 volts with the latter length of line, and improvement of $\beta\iota = 0.2$ and 0.3 was noted. This improvement, of course, is only one-sided.

B. Transfer of Current Supply on Both Sides: While in the preceding experiments the common battery supply was only on the one side, the other side having local battery supply, both sides have a common battery current source in the following tests. The wiring arrangement is seen in Fig. 2.

The long distance line L here also is a Pupin line with the characteristic Z = 2,000 and the damping exponent $\beta\iota = 2, 0$. The same arrangement that was found in Fig. 1 on side S_2 only, is now found on both sides; interoffice trunk cables and subscribers' lines are equal on both sides and the total length of the subscribers' lines is always 9 miles. In the cases where the trunk cables CT_2 and $C'T'_2$ are pupinized, their characteristic is Z = 2,400. The equivalent subscribers' stations are to be designated by S and S'. As a change can be made on both sides of the long distance lines, the number of tests that can be made increases. As, however, the two subscribers' connections are to be designated as equivalent, each two of the tests is equal in value, and serve therefore mainly as control or checks. Table II shows the results. The equivalent tests (*a* and *b*) are placed under each other. The results correspond to those of Table I. The tests can be divided into the following groups:

1. Current supply alone changed, has, however, no effect for the set in question (tests 1*a* and 1*b*, 2*a* and 2*b*).

2. The transfer of current supply alone is effective (tests 3 and 4).

3. Pupinizing of one side is effective; it has its effect for both sets of instruments (test 5).

4. Pupinizing of one side has effect, and in addition the change of battery supply is effective (test 6).

5. Pupinizing of both sides is effective and in addition the effective change of battery current supply has its effect (test 7).

TABLE II.

	Speaks Into Tele.	*Conversation compared, on the side of S*	*when there are connected on the side of S'*	*Conversation over T_2 or T_2' louder than over T_1 or T_1' by:*
1a	S	T_1 B=9 miles unpupinized permanently	T_1' B'=9 miles or C' T_2'=7.2 miles and T_2' D'=1.8 miles	B_t=0
1b	S'	T_1 B=9 miles or C T_2=7.2 miles and T_2 D=1.8 miles	T_1' B'=9 miles unpupinized	B_t=0
2a	S	C T_2=7.2 miles pup. T_2 D=1.8 miles unpup.	T_1' B'=9 miles or $C_1'T_2$=3.6 miles and T_2' D'=1.8 miles pupinized	B_t=0
2b	S'	T_1 B=9 miles or C T_2=7.2 miles and T_2 D=1.8 miles all unpupinized	C' T_2'=7.2 miles pup. and	B_t=0
3a	S	T_1 B=9 miles or C T_2=7.2 miles and T_2 D=1.8 miles all unpupinized	T_1' B'=9 miles unpupinized	B_t=0.5
3b	S'	T_1 B=9 miles unpupinized	T_1' B'=9 miles or C' T_2'=7.2 miles and T_2' D'=1.8 miles unpupinized	B_t=0.5
4a	S	T_1 B=9 miles or C T_2=7.2 miles and T_2 D=1.8 miles unpupinized	T_1' B'=9 miles or C' T_2'=7.2 miles and T_2' D'=1.8 miles unpupinized	B_t=0.5
4b	S'	T_1 B=9 miles or C T_1=7.2 miles and T_2 D=1.8 miles unpupinized	T_1' B'=9 miles or C' T_2'=7.2 miles and T_2' D'=1.8 miles unpupinized	B_t=0.5
5a	S	T_1 B=9 miles unpupinized	T_1' B'=9 miles unpup. or C' T_2'=7.2 miles pup. and T_2' D'=1.8 miles unpup.	B_t=0.5 to 1.0
5b	S'	T_1 B=9 miles unpup. or C T_2=7.2 miles pup. T_2 D=1.8 miles unpup.	T_1' B'=9 miles unpup.	B_t=0.5 to 1.0
6a	S	T_1 B=9 miles unpup. or C T_2=7.2 miles pup. T_2 D=1.8 miles unpup.	T_1' B'=9 miles unpup.	B_t=1.0 to 1.5
6b	S'	T_1 B=9 miles unpupinized	T_1' B'=9 miles unpup. or C' T_2'=7.2 miles pup. and T_2' D'=1.8 miles unpup.	B_t=1.0 to 1.5
7a	S	T_1 B=9 miles unpup. or C T_2=7.2 miles pup. T_2 D=1.8 miles unpup.	T_1' B'=9 miles unpup. or C' T_2'=7.2 miles pup. and T_2' D'=1.8 miles unpup.	B_t=1.5 to 2.0
7b	S'	T_1 B=9 miles unpup. or C T_2=7.2 miles pup. T_2 D=1.8 miles unpup.	T_1' B'=9 miles unpup. or C' T_2'=7.2 miles pup. and T_2' D'=1.8 miles unpup.	B_t=1.5 to 2.0

In tests 1*a* and 1*b*, just as in tests 1*b*, in Table I, there is no improvement, because the change of microphone current supply has taken place on the side of the person listening, not the one talking. The same is true of test 2. In this the effect of pupinizing, although used, does not show, because pupinization is effective with both positions of the switch and therefore affects the two compared results in the same manner and the same way.

Test 3 corresponds to test 2*a* of Table 1. The same can be said of test 4; for, as we said before, the change of current supply on the side of the listening person has no effect on clearness of communication. Therefore we get only the same result as in experiment 3.

The result of test 5 seems to be samewhat better than the corresponding test 2*d* in Table I. This might be due to measuring method, which allows for subjective influences. It might also be that owing to the change made on the one side there came about reflection phenomena, though they were very slight. Test 6 corresponds to test 2*c* of Table I. The tests for 7 give the best results, as might be expected, as the favorable effect for pupinizing on both sides as also change of current supply for each of the subscribers comes into play. In practice such a case would appear, when two larger cities with extensive long distance traffic were to combine and change the current supply from long distance to local exchanges in both cities, also pupinizing the interoffice trunk lines.

C. Influence of the Long Distance Line: In order to study the influence of the long distance line itself, the following tests were made, where the current supply was

TABLE IIIa.

S_1= local battery set. Characteristic of trunk cable C T_2, pupinized, Z=2400.

	Conversation in Tel.	*Conversation compared alternately over T_1 and T_2*	*Type of line used, and result: Pupinized line Z=2000*	*Ordinary overhead line Z=600*	*Cable without increased inductance, Z=500*
1a	S_2	T_1 B=7.2 miles unpup. C T_2=5.4 miles unpup. T_2 D=1.8 miles unpup.	*Conversation over T_2 louder than over T_1 by:* B_t=0.2 to 0.5	B_t=0.2	Slight
1b	S_1	Same	B_t=0	B_t=0	B_t=0
1c	S_2	T_1 B=7.2 miles unpup. C T_2=5.4 miles unpup. T_2 D=1.8 miles unpup.	B_t=0.5 to 1.0	B_t=0.5	B_t=0.2 to 0.5 Speech much clearer
1d	S_1	Same	B_t=0.5	B_t=0.2	B_t=0 Speech clearer

TABLE IIIb.

S_1=Local battery set. Characteristic of trunk cable C T_2, when pupinized Z=1600.

	Conversation in Tele.	*Conversation compared alternately over T_1 and T_2*	*Type of line used and result: Pupinized open air line Z=2000*	*Ordinary Overhead line Z=600*	*Cable without incr. inductance Z=500*
1a	S_2	T_1 B=9 miles unpup. C T_2=7.5 miles unpup. T_2 D=1.5 miles unpup.	*Conversation over T_2 louder than over T_1 by:* B_t=0.5	B_t=0.5	B_t=0.2
1b	S_1	Same	B_t=0	B_t=0	B_t=0
1c	S_2	T_1 B=9 miles unpup. C T_2=7.5 miles unpup. T_2 D=1.5 miles unpup.	B_t=1.0	B_t=0.5 to 1.0	B_t=0.2 to 0.5
1d	S_1	Same	B_t=0.5	B_t=0.2 to 0.5	B_t=0.2
2a	S_2	T_1 B=6.6 miles unpup. C T_2=4.8 miles unpup. T_2 D=1.9 miles unpup.	B_t=0.2	B_t=0.2	B_t=0
2b	S_1	Same	B_t=0	B_t=0	B_t=0
2c	S_2	T_1 B=6.6 miles unpup. C T_2=4.8 miles unpup. T_2 D=1.9 miles unpup.	B_t=0.5 to 0.7	B_t=0.5	B_t=0
2d	S_1	Same	B_t=0.5	Very little	B_t=0

TABLE IIIc.

S_1= Common battery set. Characteristic of trunk cable C T_2 when pupinized. Z=2400

	Convers. by Tele.	*Conversation compared alternately over T_1 and T_2*	*Type of line used and results: Pupinized line Z=2000*	*Ordinary overhead line Z=600*	*Cable without incr. induct. Z=500*
1a	S_2	T_1 B=9 miles unpup. C T_2=7.2 miles unpup. T_2 D=1.8 miles unpup.	*Conversation over T_2 louder than over T_1 by:* B_t=0.5	B_t=0.5	B_t=0.2
1b	S_1	Same	B_t=0	B_t=0	B_t=0
1c	S_2	T_1 B=9 miles unpup. C T_2=7.2 miles unpup. T_2 D=1.8 miles unpup.	B_t=1.0 to 1.5	B_t=0.5 to 1.0	B_t=0.5
1d	S_1	Same	B_t=0.5 to 1.0	B_t=0.2 to 0.5	B_t=0.2 to 0.5

changed only on the one side and pupinizing was used. Fig. 3 gives the wiring diagram for these tests.

In these tests, a subscriber's cable *EF* of 1.8 mile length is connected on the side S_1, in order to keep within the range of length used for the other experiments. Three types of long distance lines have been used: a Pupin line with a characteristic of $Z = 2{,}000$, an ordinary overhead wire with characteristic $Z = 600$ and a cable line with increased inductance and the characteristic $Z = 500$. All three types of line were represented by calibrated and known experimental lines. S_1 = local battery set. The characteristic of the interoffice cable CT_2, when pupinized is $Z = 2{,}400$.

The results for the various tests are combined in Tables III*a*, III*b* and III*c*. In experiments III*a* and III*b* the subscriber's set S_1 was a local battery set, in experiments III*c* a common battery set. In this case a repeater was connected at *F* as well as the common battery. The interoffice trunk cable CT_2, when loaded with Pupin coils, had with tests III *b* the characteristic 1,600, with tests III*a* and III*c* that of 2,400 ohms.

During a portion of the tests (Table III*b*) the paper insulated cable usually employed was not on hand; in these tests a new cable of similar diameter (0.8 mm) had to be employed, whose various lengths differed, however. Consequently this accounts for the difference in lengths of trunk and subscribers' cables.

The conclusion can be drawn from the results, that with the use of Pupin lines and ordinary open air wires a favorable effect can be obtained both by changing the location of the current supply and also by pupinizing the trunk cables. Ordinary cables do not come into question for use as long distance cables. The experiments show, however, that even with ordinary cables there is an improvement, if not in strength of sound as much as in clearness.

If we compare the test 1*b* with 1*d* (tables III*a* and III*c*) anr 1*b* with 1*d*, as also 2*b* and 2*d* (Table III*b*), then we see the favorable effect which the pupinizing of the interoffice cable exerts, even when microphone current supply is not transferred on the side of the subscriber who does the talking.

The tests 1 (*a, b, c, d*) Table III*a*, and the tests 2 (*a, b, c, d*) Table III*b* show that the various characteristics of the office trunks are not of great influence. These two series may be compared, as the cable lengths are fairly even.

A comparison of tests 1*d* and 2*d* (Table III*b*) shows that in a cable without increased inductance the influence of pupinizing the trunk cables enters in only when great lengths are reached, and then only to a small extent.

When comparing Tablese III*a* and III*c* one sees that the improvements are greater for use of common battery, than for local battery supply.

Summary: 1. In larger cities with several exchanges, the change of current supply from the long distance to the local exchange gives an improvement in loudness of sound, which is greater in proportion, as the subscribers' cable line is longer. The length of subscriber's line from subscriber to local exchange should be as short as possible.

2. The gain in quantity of sound is of course only onesided and does not benefit the subscriber in whose district the change is made; nevertheless it is important, as conversation over long distance is only practical if both subscribers can understand clearly.

3. A further improvement of quantity of sound is reached, if the office trunk cable between long distance and local exchange is pupinized, the battery for current supply being changed at the same time to the local exchange.

4. Improvement of sound through pupinizing affects both subscribers equally.

5. Increasing the voltage of the feed battery gives a certain improvement of sound, but this is far less than that obtained by changing the current supply to the local exchange and pupinizing the interoffice trunk cables.

6. Improvement of sound by change of current supply and pupinizing of the trunks is increased, if this is done in both of the cities that are connected by long distance. Pupinizing always benefits both subscribers, change of current supply only the one subscriber.

7. The above results remain the same, generally speaking, regardless whether a Pupin line, an ordinary overhead wire or an ordinary cable is used, even though there may be slight numerically differences.—*Fêrnspr. Tech.*

EXCHANGE CABLE TERMINAL WITH OIL INSULATION.

The purpose of cable distributors in telephone exchanges, as we may call them, is to give a better degree of utilization of telephone cables, as they terminate at the telephone exchange. The distributors are used, when bringing the telephone line cable (paper cable), to the exchange cable manhole, dividing it by splicing and then bringing the splices, usually after division into 50-pair cables, to cable and sleeves with cable sockets and terminals. One section of the cable terminals is connected with the exchange switchboard or the distributing frame, the other with the cable distributers or the cable splices, or other types of seals for the paper cables. We might call the former exchange terminals, the latter line cable terminals. The terminals belonging to subscribers' telephone conductors in use are connected by loose jumper wires with the terminal clips of the switchboard cable,

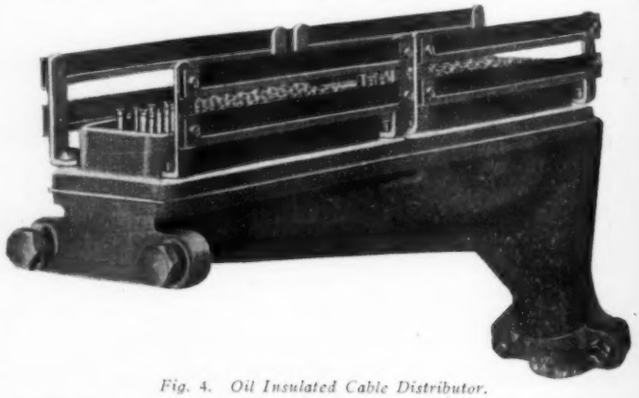


Fig. 4. Oil Insulated Cable Distributor.

while those conductors of the line cable that are in reserve are left loose, ready to be connected to new subscribers' line terminals.

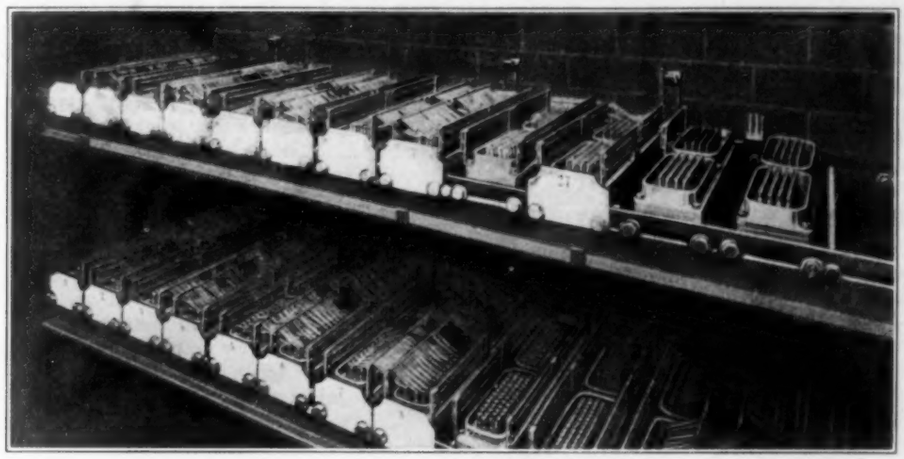
With the large number of closely packed cable sockets and terminals found in the cable distributor, the presence of moisture must be carefully guarded against, as otherwise disturbances in conversation will take place. It is therefore essential to install the cable terminal equipment in buildings in cellars that are not exposed to moisture. Often the difficulties are so great that it is

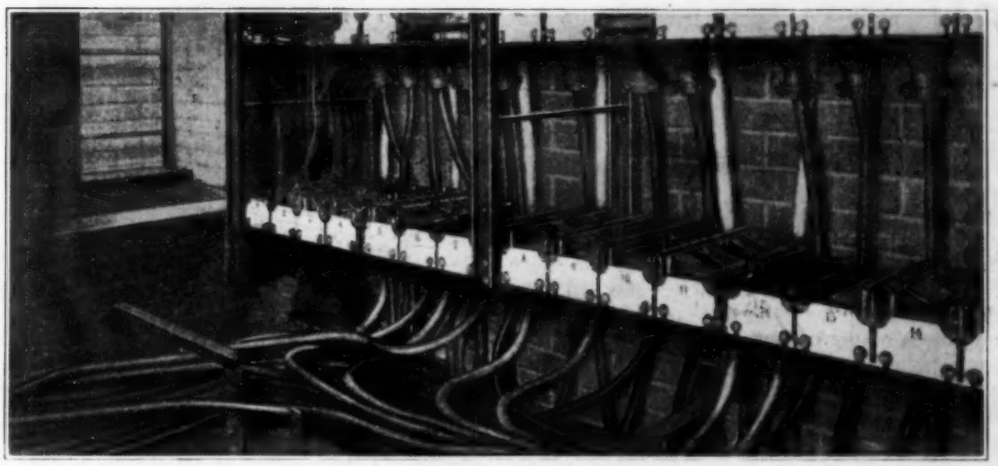
impossible to do otherwise than place the cable distributor either in special cable shacks or else in manholes under the street surface. In all cases care must be taken to exclude moisture and dampness and yet to keep the parts of the cable easily accessible. The oil insulated cable tributor. A better method to relieve the congestion is pecially not in smaller exchanges.

In such cases another type may be used, which is suitable for the narrow space within which we have to work in a cable manhole. It is shown in Fig. 4 and can take care of the spliced 50-pair cables. They are placed on iron racks along the walls of a cable manhole and are about 19 in. long and 4 in. wide. Such rows can be placed at distances of 12 to 18 in. in sets of three and four over one another. The connections are made so that in each group there is a certain number of reserve conductors, perhaps 15 for each group. The distributors are so arranged that for every two switchboard cable distributors there are three distributors taking care of the spliced conductors from the line cable end. The terminal clips of the line cable distributor are connected with the terminal clips of the switchboard cable distributor by loose rubber insulated jumper wires, the nearest connections being used in all cases. If all the terminals of one of the switchboard distributors have been exhausted, connections can be made from the line cable distributor through guide sleeves with the terminals of another distributor. This is not advisable, though, as it makes inspection of each group of wires more difficult. It is better to install another exchange wire distributor. A better method to relieve the congestion is to set an entire different distributor on the line cable in place of the one with a great many subscriber wires. In other words a line cable with a larger number of spare and unused reserve wires would be brought with its line cable distributor underneath the exchange cable distributor with too many used wires and the cable with the used wires would be changed over to an exchange distributor with fewer connected wires. All that need be done, is to disconnect the terminals on the switchboard side of the cable and then to move the entire distributor. Prerequisite is that the unspliced cable be long enough to permit this change.

The cable manhole for these distributors should be given a semicircular form, so that all distributing frames may be equidistant from the entrance of the cable in the manhole. If we imagine a semicircle, the cable would enter the manhole about where the center of the completed circle would be. The cables would then pass in radial directions towards the semi-circular walls of the manhole along which are ranged the distributing boxes on iron racks. All of the line cables lie on the bottom of the manhole on a wooden flooring and can be covered over for safety's sake, with a woden top. A number of distributor frames can be kept as reserve for growth.

Figs. 5 and 6 show a cable manhole with distribu-





Figs. 5 and 6. Cable Manhole With Distributers.

tors holding 4,000 switchboard conductors and 6,000 line cable conductors. The distributor frames are placed in three rows over each other. They are not covered in any way. The oil insulation in this case has given excellent results, even though the cable manhole itself is not particularly free from dampness. The only care is to examine the rubber jumper wires from time to time for appearance of mould and to exchange the mouldy ones, which is easily done. The main cables on entering the manhole were immediately bent downward and then spliced into smaller cables of 50-pair each and then connected to the distributors.—*Fêrnsp. Tech.*

THE INFLUENCES OF THE TAR OIL ON THE LIFE OF POLES.

One of the most effective pole preservation methods is the creosoting method, which uses tar oils. Within the last few years this process has become more and more important, as it seems to offer the best method for treatment of poles. According to its nature creosoting represents an oily impregnation of the poles. Poles treated by this method show therefore an entirely different behavior from those treated with salts like the fluorides. Those using these kinds of poles will, therefore, be interested in finding out, whether the oil forced into the wood keeps its original nature or whether it undergoes changes that affect the life of the pole.

If we deal with the saturation method, in which the poles are steeped in the tar oil saturation, their surface offers an oily appearance, which lasts through many years and makes them rather disagreeable in handling. The improved method, which is more economical and gives a more evenly distributed saturation with a smaller quantity of oil, has done away with the extremely oily surface. Long storage of the poles before use for telephone material, gave them the dry appearance that is desirable.

The drying of the oil soaked poles is based on a resining effect of the oil, especially in the sections near the surface of the pole. These layers become firm and hard with time and cannot sweat and pass moisture to the surface, as they could under other conditions. This resining effect has another important meaning besides that for the appearance and handling of the pole. In all the poles that are being used and stand therefore vertical, the oil has tendency to follow the paths taken by the life sap of the tree and to flow downward owing to the law of gravity. The fresher the treated poles are, the more quickly does this flow of the fairly mobile tar oil take place. This tar oil flows out at the base of the pole, collects there and forms a sort of antiseptic ring around the base end of the pole. This end is the one mostly exposed to the attacks of the fungi and needs, therefore, the most protection. The longer the pole has been stored before being set up, the further will the resining effect have taken place and the slower will be this flow of the tar oil downward. The advantage of long storage or seasoning after creosoting is therefore apparent, as it prevents too rapid a loss of tar oil.

Investigations have been made to see how much oil there was left in a pole after it had been used a number of years. It was found that at the upper end of the pole there was left only 1/7 of the oil originally forced into the pole. At the center this proportion was somewhat larger and at the base more than 1/3 was still found. Through the downward flow of oil the upper end of the pole had lost the most oil, while the lower end had collected the most. This is really as it should be, for the lower end, exposed to the moisture in the ground needs the most protection. The upper portions of the pole may be said to represent a reservoir of oil, from which oil is sent down to the base of the pole, where the preservative is needed the most. It is likewise shown how enecessary it is to work with a certain excess of tar oil and not to carry the economy creosoting processes too far. The nature of the soil also has its effect on the life of the pole. Clay soil helps to preserve the pole, while sandy soil favors the flow and dissipation of the oil at the bottom of the pole into the surrounding earth and exposes the pole to the attack of fungi.—*Chem. Annal.*

McQuarrie on Switching Systems

J. L. McQuarrie of New York, the Western Electric Company's assistant chief engineer, lectured recently at Hawthorne on "Machine Switching Systems for Telephone Exchanges." By the aid of a series of pictures and very clever diagrams Mr. McQuarrie led his audience, step by step, from the present manual telephone offices, through a small mechanical office of 100 lines, to the complexities of a 10,000-line full mechanical system and, finally, into the type of equipment the company's engineers have developed.

Mr. McQuarrie explained in some detail the principal parts of the new apparatus, giving considerable attention to the new selectors, which are quite a departure from present practice, in that the capacity of each unit is 500 lines instead of the usual 100 lines. These switches, which are driven by continuously moving rollers, are controlled by switching devices called registers. In the full mechanical system the movement of the subscriber's dial sets all the necessary mechanism into operation, and the "call" is completed without the aid of any second person.

In semi-official offices each operator's position is provided with a keyboard, similar to the keyboard of an adding machine. These keyboards are connected to the registers and perform the same function as does the subscriber's dial in a full mechanical office.

A number of very interesting pictures were shown of the various types of switchboards which are being developed to adapt the machine switching apparatus to the present manual exchanges.

Telephone Aids Stage Lighting

Many great motion pictures of the day are directed by means of the telephone, but the telephone is used not only for directing motion picture scenes, but also as a modern aid in securing desired lighting effects in connection with the staging of scenes in a theater catering to legitimate drama.

An expert in lighting effects equipped with an operator's set, occupies a seat in the audience and transmits instructions to the stage electrician also equipped with an operator's set, who is stationed at the electric light switchboard, which is located on one side of the stage.

By using the telephone, the most perfect lighting arrangements can be obtained and proper adjustments made at the instant under expert direction without the noise of bells, buzzers or other signals, as the telephone line is in constant use throughout the performance.

The stage electrician is so located that it is impossible for him to see the lighting effect as it is seen by the audience. The telephone has again solved a problem and has accomplished the desired results with success.

Correspondence with the Front

Mail and Telegraph Between the United States and the American Expeditionary Forces

THE War Department authorizes the following:

Instructions covering the conduct of personal correspondence by mail or telegraph between the Unitel States and American military forces in Europe are now being prepared in the form of a bulletin by the War Department, soon to be published.

In substance the rules to be followed are as follows:

Mail addressed to members of the expeditionary forces should bear the complete designation of the division, regiment, company, or other organization to which the addressee belongs.

In the upper left-hand corner of a letter should be placed the usual form of return request and the name and address of the sender.

STATION OF UNITS BARRED

Under no circumstances will the location or station of a military organization be included in the address on a letter for a person or organization in Europe.

Postage should be fully prepaid. The rate on letter mail to our military forces in France is 2 cents the ounce or fraction thereof. Newspaper mail is carried for 1 cent for four ounces.

Letters, post cards and printed matter originating in the United States or any of its possessions for transmission to the United States expeditionary forces in Europe are subject to the United States domestic classification, conditions and rates of postage.

No other than United States postage stamps are available for the prepayment of postage.

HOW TO ADDRESS LETTER

The correct manner of addressing a letter is as follows:

Return to
Mrs. John Smith, (STAMP)
——Blank Street,
New York City.

John Smith, Jr.,
Co. X, ———— Infantry,
American Expeditionary Forces.

Mail for American military personnel in Europe will not be forwarded in care of the adjutant general of the army as a general rule. This may be done, however, in cases where the writer does not know that the addressee has actually embarked.

LETTERS WRITTEN BY SOLDIERS

Mail addressed to persons in the United States or any of its possessions will be addressed in the usual way, but nothing will be written in or on a letter to indicate the place or station of the writer, or any person or organization of our own forces or those of our allies.

The United States mail service established in France is prepared to sell postage stamps, post cards, etc., to our military forces. In cases where the soldier may be unable to purchase stamps to prepay postage the letter may be indorsed by the proper officer and forwarded to its proper destination, where the single rate of postage will be collected on delivery. This is provided for in the postal regulations.

Mail from Europe may bear the name and organization of the sender in the upper left-hand corner. It is subject to domestic rates and to the use of United States postage.

MONEY ORDERS PAYABLE

Money orders payable at the United States postal agency or its branches in Europe will be sold to purchasers in the United States or its possessions, and money orders payable in the United States or its possessions will be sold to purchasers at the agency or its branches in Europe, under regulations provided by the postoffice department at domestic rates.

Money and valuables will not be accepted for transmission by registered mail. Important papers which can be duplicated if lost may be accepted for registration, but indemnity will not be paid for lost registered mail. Postal money orders should be used.

There is no provision at present for parcel post service between our forces in Europe and the United States or its possessions.

HOW TO SEND CABLEGRAMS

Private telegrams to be cabled to members of the American expeditionary force in Europe will be addressed "Amexforce, London," with the addressee's name and the official designation of the unit to which he belongs appearing as the first words of the text. When so addressed they will reach an official who knows the location of the various American units and who will forward the message by mail to the proper destination.

Under no circumstances will the location or station of a unit be designated in the address or body of a telegram.

Examples are given as follows:

A telegram to Capt. John B. Jones, Medical Corps, United States Army Base Hospital No. 10, American Expeditionary Forces, would be in the following form:

Amexfore, London.
John B. Jones, Base Hospital Number 10.
Have followed your instructions.
MARY JONES.

Or, for Pvt. H. K. Smith, Company K, Forty-seventh United States Infantry:

Amexforce, London.
H. K. Smith, Co. K, Forty-seventh U. S. Infantry.
Will not change address. JANE SMITH.

MESSAGES IN PLAIN LANGUAGE

To comply with European censorship regulations all messages must be written in plain language (English or French) or in an international code, and must be intelligible to the censors. The use of two codes or two languages or of combinations of code and plain language in the same message is forbidden. Telegrams without text or with but one plain language text word are not admitted. Code language may be used only in full-rate messages.

Codes authorized by the British censorship are: A. B. C. 5th; Scott's 10th; Western Union; Lieber's; Bentley's Complete Phrase Code (not including the oil and mineral supplements); Broomhall's Imperial Combination Code; Broomhall's Imperial Combination Code, Rubber Edition; Myers Atlantic Cotton Code, 39th Edition; Riverside Code, 5th Edition.

CODE MESSAGES

In case of a code message the name of the code must be designated when the message is filed. It is pointed out that it is useless to make use of codes unless

the person to whom the message is addressed is stationed in a city where he may have access to a code book.

The War Department is considering the feasibility of authorizing the use of the Army and Navy Code, which has been in use for trans-Pacific messages, in addition to the nine codes mentioned.

Every telegraph message must be signed. The surname alone may be used, but such a signature as "John," "Mary," "Mother," etc., will not be passed.

Attention is called to the fact that there are three classes of service available—full rate, deferred rate, and week-end rate.

It is the intention of the War Department to detail an officer specially to care for army mail matters.

Dayton Gets Central Union Money

In order to extend the scope of work, to develop efficiency, education, to promote the welfare of employes and to give the public better service, it was announced by Harry E. Allen, district general manager of the Central Union Telephone Company at Dayton, Ohio, that offices of the company, at present located in the company's building on North Ludlow street, would be moved to the building at present occupied by the Citizens Motor Car Company, a few doors north of the present location of the offices, and that many changes would be made in the arrangement of the company's building.

The improvements will cost approximately $150,000, and the new toll board which will be installed will cost approximately $60,000 or $70,000.

With offices in the Steely building, as proposed, the company's building will be devoted wholly to telephone service. All bills will be paid and contracts signed, all complaints registered and all business will be transacted in the new offices.

In the company's building the long distance is at present located on the third floor. This will be moved to the second floor, and the space that is at present occupied by "long distance" will be used for local work only. Everything will be modernized.

The first floor, now occupied as offices, will be divided into school rooms, locker rooms and dining rooms, with two lecture and practice rooms. Part of the second floor will be rearranged to provide a larger rest room for the telephone operators. Everything will be done that will tend to bring about a higher standard of efficiency, better service for the public and better facilities for the operators.

The Central Union Telephone Company also intends to extend the building of the East End exchange, and to add another switchboard, to take care of the many subscribers who have applied, and incidentally to add more operators. This will not be done until about the first of next year.

Linemen of the telephone company are at present working on three copper circuits to Cincinnati, and three to Middletown and Hamilton. Much work is being done in the suburbs of the city by linemen.

An exchange with two separate switchboards, which will be equipped with more than 300 telephones for the present, and the capacity of which is to be 640 telephones, is being installed by the company at the Wilbur Wright aviation field. All wiring is underground, so as not to interfere with flying about the field. Twelve pole lines have been built to the field at an expense of $3,000.

At present the company is employing about 250 telephone operators, which is an increase of 25 per cent over last year. The company last year spent more than $200,000 for improvements. More than $100,000 has already been spent by the company this summer, and many more changes which are anticipated will demand more time and money, but will mean better service for the public.

Newark Automatic Growing

The work of building an extension to the central building of the Automatic Telephone Company at Newark, Ohio, is being rushed and will probably be completed by the middle of September or the first of October.

The building easily adapted itself to a second floor which is being built over the store on the south side of the Arcade. The building was heavily reinforced with steel beams, and the room of the new story is already in place, this precaution being taken so the roof of the first story can be taken out and the floor laid. The side walls will soon be in place.

The addition will be 75 feet long and 16 feet wide. A door will be cut in where the tool room now is and the new rooms will quarter the new tool room, rest rooms, Manager Hollander's office, the office of the manager's clerk, and the directors' rooms.

New automatic equipment will be installed and a new automatic toll board.

The addition will enable the company to care for between 1,200 and 1,500 new subscribers, and the facilities for new subscribers under present conditions would have soon been exhausted.

North Dakota Taxes Higher

An increase of more than 100 per cent in some instances in the assessed valuation of telephone companies doing business in the State of North Dakota has been tentatively adopted by the Board of Equalization of the State Tax Commission. The tentative assessments, however, do not show any increase over last year in the assessment of telephone exchanges with less than 500 telephones, but exchanges with more than 500 telephones are assessed from 100 per cent to 125 per cent higher than a year ago.

Telephone exchanges with 501 to 1,000 telephones last year were assessed at $24 per telephone; the tentative assessment this year is $48. Exchanges operating 1,001 telephones or more were assessed at $26 per telephone last year, which compares with a tentative assessment of $60 per telephone this year. The following table shows the tentative assessment of telephone companies along with the assessment of last year:

	1916	1917
1 to 100 telephones	$12	$12
101 to 250 telephones	19	19
251 to 500 telephones	21	21
501 to 1,000 telephones	24	48
1,001 and more telephones	26	60

The 1917 assessments, however, are only tentative and are subject to revision by the State Board of Equalization. Application of the tentative assessments in Fargo would mean that the valuation of the Fargo exchange, which was assessed last year on a basis of 4,639 telephones, will be increased from $120,614 to $278,340. At Grand Forks the Northwestern Telephone Exchanges, operating 2,352 telephones, were assessed $61,152, which will compare with the valuation of $141,120 for the same number of telephones this year, if the tentative schedule is adopted by the State Board of Equalization.

Our Government and Labor

War Bulletin No. 15 of the Chamber of Commerce of the United States of America

DEPARTMENT OF LABOR

THE point of contact between our government and labor problems is the Department of Labor. When the President, secretary of war, or other member of the administration desires information or advice with regard to some labor problem, reliance is had upon the secretary of labor. Consequently, there should be widespread knowledge of the secretary's official statement concerning his general position regarding labor activities during the war and controversies between employers and employes during this time.

EXISTING STANDARDS

First, it may be said that on April 7, 1917, the Council of National Defense adopted a resolution submitted by the executive committee of the Committee on Labor of the Council of National Defense, including the following:

That the Council of National Defense will issue a statement to employers and employes in our industrial plants and transportation systems advising that neither employers nor employes shall endeavor to take advantage of the country's necessities to change existing standards. When economic or other emergencies arise requiring changes of standards, the same shall be made only after such proposed changes have been investigated and approved by the Council of National Defense.

NO ADVANTAGE OF ABNORMAL CONDITIONS

The secretary of labor is, of course, a member of the Council of National Defense, and on April 23, 1917, speaking for the Council, he said with reference to the above resolution:

The Council of National Defense takes this position, that the standards that have been established by law, by mutual agreement, or by custom should not be changed at this time; that where either an employer or an employe has been unable under normal conditions to change the standards to their own liking, they should not take advantage of the present abnormal conditions to establish new standards.

He also said:

That employers and employes in private industries should not attempt to take advantage of the existing abnormal conditions to change the standards which they were unable to change under normal conditions.

HOURS OF LABOR

The secretary mentioned the hours of labor as among the standards referred to and pointed out that by custom certain standards constituting a day's work had been established, varying from seven hours per day in some kinds of office work to twelve hours per day in continuous-operation plants.

ORGANIZATION OF UNIONS

With regard to the organization of unions, the secretary said that, speaking solely for himself, his attitude was that

Capital has no right to interfere with workingmen organizing labor any more than the workingman has a right to interfere with the capitalists organizing capital. The two are on a parity on that point, and so my feeling is that in the present emergency the employer has no right to interfere with you in your efforts to organize the workers into unions, just as you have no right to interfere with capitalists organizing capital into corporations. If you can get a condition where efforts to organize the workers are not interfered with, and where a scale of wages is recognized that maintains the present standard of living, it occurs to me that for the time being no stoppage of work should take place for the purpose of forcing recognition of the union.

GOVERNMENT'S POLICY

The above statements should be carefully studied by all business men, as they represent the declared policy of the government with regard to labor matters in connection with the war.

There is no doubt that many persons in the government today believe that it is important in connection with the prosecution of the war that labor should become organized and be dealt with by the employer and the government through these organizations.

BRITISH POLICY

The message brought to this country by James Thomas and Charles W. Bowerman, who were sent over from England by Lloyd George to advise this country as to what had been done in England in connection with labor problems, was that the English government throughout the war had recognized the importance of dealing with labor through labor organizations, having encouraged the further organization of labor and dealt with organized labor on all problems which affect labor. In England labor has been largely unionized for some years.

AMERICAN CONDITIONS

On the other hand, many persons here emphasize that conditions in this country are essentially different from those in England, and that in this instance, as in others, English experience will be most helpful to us if used with discretion.

All agree that industrial peace should be promoted during these times of concentrated national energy. As indicated above, the spokesman for the government has taken the position that industrial peace will be promoted by continuing the status existing when the war began so far as standards of hours and recognition of the union are concerned. But the secretary of labor has expressed his personal opinion that the peaceful organization of unions may go on.

No Embargo Yet in Chicago

The Chicago Telephone Company has not found it necessary as yet to follow the example of some of the eastern telephone companies in installing no more private or commercial telephones during the war. Supplies of various kinds are scarce, however, and it may be found necessary to take some action in regard to the extension of telephone lines.

In announcing its policy of installing no more telephones, the New England Telegraph and Telephone Company gave as its reasons the difficulty of obtaining raw materials, high prices, shortage of labor and the large military demand.

"It is getting more and more difficult to get some of the materials," said Clifford Arrick of the Chicago Telephone Company, "but we have not found it necessary to stop installations. Government business will be given preference over commercial business, but so far the government business has not been so great as to interfere."

Big Four Telephone School

Women, girls and young men exempted from army service will be students of a school for telephone operators to be established soon by the Big Four Route at a place to be announced later.

Thousands of applications for work from women are on file.

Graduates of the telephone school will be placed in positions paying from $75 to $8 per month, with an eight-hour day.

Handling of train orders by telephone will be chiefly taught in the school.

Tension in Suspension Strand

By L. C. Eddy, Jr.

Overhead telephone cables are commonly suspended from steel or iron strand by means of cable rings. While splicing cable or placing cable rings the workman often rides the strand with his entire weight concentrated at one point of the span. In such cases the approximate tension in the strand may be determined by a simple triangular method which assumes the strand to extend in

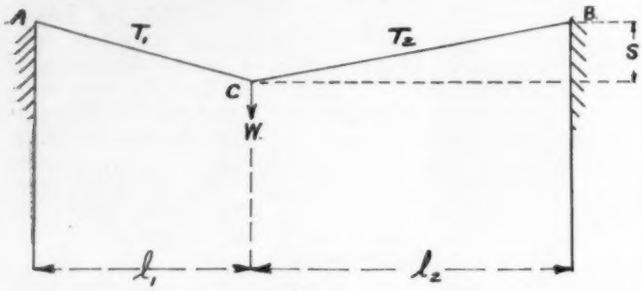


Fig. 1.

straight lines from workman to poles, as shown in Fig. 1.

Draw a triangle, *MNK*, with sides parallel to T_1 and T_2 as shown in Fig. 2. *PMN* is similar to *BCD*. *PMK* is similar to *ACD*. *PK* is equal to

$$\frac{sl_2}{l_1}. \quad \text{But } \frac{T_1}{W} = \frac{MK}{NK} = \frac{\sqrt{PM^2 + PK^2}}{PK + S}$$

$$\text{and } \frac{T_2}{W} = \frac{MN}{NK} = \frac{\sqrt{PM^2 + S^2}}{PK + S}$$

Substituting common values for length of span and amount of sag in these equations it is found that the tensions T_1 and T_2 are nearly equal when the sag is small (wherever weight, *W*, is placed), but that the tensions T_1 and T_2 are by no means equal when the sag is large if weight is not in middle of span. The tension in T_1 and T_2 becomes much greater, of course, when the sag is decreased or the weight of workman and cable car ("bosun's chair") is increased. For example, let $l_1 = 100$ ft., $l_2 = 200$ ft., $S = 2$ ft., and weight of workman and car equal 200 ft. Then

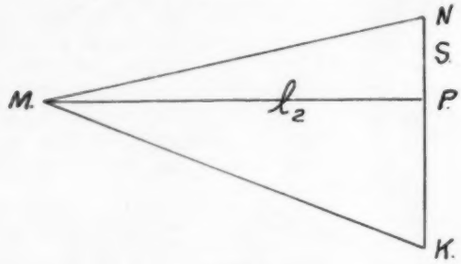


Figure 2.

$$PK = \frac{2 \times 200}{100} = 4.$$

$$\frac{T_1}{200.} = \frac{\sqrt{200^2 + 4^2}}{6} : T_1 = 6670 \text{ lb.}$$

$$\frac{T_2}{200} = \frac{\sqrt{200^2 + 2^2}}{6} : T_2 = 6669 \text{ lb.}$$

With sag of only one foot these tensions are greatly increased.

This method neglects the weight of the strand, but it does not require calculations involving the equation of the curve formed by the strand.

Shunts and Short Circuits

Shunts and short circuits (not taking into consideration grounds and some other features that cause trouble for telephone men and telephone users), are about as serious a thing as we have to contend with, says James Stewart in *The Mouth Piece*.

It has been said of one of the participants in the present world war that the men have no individuality simply because they always have followed a leader without thinking for themselves. Are you one of that kind of men? Do you depend entirely upon somebody else to locate your trouble for you? Do you have the satisfaction that yourself, and yourself alone, has accomplished the thing you ever set out to do, or has the test table man or the wire chief been the chief factor in locating your trouble for you? Possibly using the same medium you could have used yourself, in other words, are you allowing yourself to be led or are you leading yourself? Because you must first lead yourself before you can possibly expect to lead others.

Locating and clearing shunts and grounds is very interesting for the man that leads himself, but must be monotonous for the man that is led to it by the test table man or wire chief. The familiar questions, over the line —"How do you get it now?" and the answer, "Still open, short or grounded," whatever the case may be, always makes me feel that either some men do not want to know or are too lazy to learn to help themselves.

I have talked to several fellows, including wire chiefs, concerning the manner in which they test and they have assured me that they always help themselves, when going after the trouble, but I have heard the same men call test table and ask the same old question, "How do you get me?" and the same wire chiefs have allowed them to go on asking and will no doubt continue to allow it. I know of one wire chief who claims he is too busy to go out with his men; I know of another who has time to go out and make inspections of how installers do work, but does not go out with the installer and get down to brass tacks and show him how.

Let the wire chief develop into a real leader and the men will follow and be able to lead themselves. In fact, let all men who know a little more than the other fellow be leaders, and you will soon find how interesting it is to watch the other fellow grow and see yourself keep just ahead of him by your application of what you are teaching.

Owatonna Case Gone to Trial

Appeal from the recent order of the State Railroad and Warehouse Commission directing physical connections of the Northwestern and Tri-State telephone lines at Owatonna, Minnesota, which is expected to be carried to the highest court and become the most important telephone regulation case on record has gone to trial before Judge A. B. Chillrenn in the Steele county district court.

Wednesday and Thursday, September 19 and 20, are the dates set for the convention and operators' school of the Indiana Independent Telephone Association. Everybody is invited.

Interstate Commerce Commission Orders

Classification of Employees and Specifications for Maps, Charts and Schedules

RULES GOVERNING THE CLASSIFICATION OF TELEPHONE EMPLOYEES

Effective as of July 1, 1917

1. *Definition of Employees.*—For the purpose of statistical count and classification the word *employees*, as used herein, is intended to include all persons in the service of the reporting telephone company subject to its continuing authority to supervise and direct the manner of rendition of their service, regardless of the fact that certain of such persons may be devoting part time only to the service of the company; may be employed for temporary periods; or may be absent temporarily on leave (e. g., vacation) or on account of disability due to accident or sickness. It is intended to exclude persons engaged to render only specifically defined service and not subject to the continuing authority of the company to supervise and control their acts, such as independent contractors performing specific work or services for the company but not under its direct control and management; also persons who receive only a royalty or retainer from the company; pensioners not required to render service; persons absent on definitely granted leave without pay and not subject to call for duty; and persons temporarily laid off from service. Persons on vacation, whether with or without pay, should be considered employees if subject to call for duty.

2. *Counting Employees.*—Section 20 of the Act to Regulate Commerce requires that telephone companies in their annual reports to the Interstate Commerce Commission shall state "the number of employees and the salaries paid each class." The number of employees being likely to fluctuate, telephone companies are required to classify and count their employees, male and female separately, at two different times each year, viz., as of the end of each of the months of June and December. The last day of the month shall be considered the end of the month, except when it falls on a Sunday or a holiday, in which case the count shall be made as of the last preceding business day. Every person sustaining to the telephone company the relation of employee, as defined in section 1 above, shall be included in the count.

3. *Joint Employees.*—Each person (except as provided in the next succeeding paragraph) *concurrently* engaged under a joint arrangement in the service of two or more telephone companies, shall be considered a joint employee and shall be counted by each telephone company involved in such joint service arrangement and represented in its return of the number of employees by a fraction based on the number of telephone companies served. For example, if such an employee is in the service of three telephone companies, each such company shall report him under the number of employees as one-third of an employee. If, however, the entire compensation of an employee concurrently engaged in the service of two or more telephone companies is borne by a single telephone company, he shall, for the purpose of these returns, be treated as an employee of that company and not as a "joint" employee.

A person employed by and serving two or more telephone companies in the capacity of a general officer but acting *independently* for each company shall be counted and reported as one employee by each company. The term "general officer" as here used means an officer serving a company in such a capacity as that of president, vice-president, secretary, treasurer, general counsel, general solicitor, controller, general auditor, general manager, or chief engineer.

4. *Classification of Employees with Respect to Character of Service.*—Employees shall be classified with respect to character of service rendered in accordance with the definitions of classes given below. Where an employee's duties are such as to make him includable in two or more classes he shall be counted under that classification indicated by the prepondering character of his work, and the return of his rate of compensation shall be assigned to the same classification.

1. GENERAL OFFICERS AND ASSISTANTS.—Include under this head employees engaged in the general supervision of the affairs of a company as a whole, together with their special staff assistants, and those engaged in the supervision of a general department of a company, such as president, assistants to president, vice-presidents, assistants to vice-presidents, secretary, assistant secretaries, treasurer, assistant treasurers, general counsel, general solicitor, controller, general auditor, general manager, or chief engineer.

2. OPERATING OFFICIALS AND ASSISTANTS.—Include under this head employees engaged in, and responsible for, the administration of an entire operating department of a company or a division or district thereof, and those engaged either in the supervision of certain phases of the work of an operating unit or in staff or research work incidental thereto, such as general, division, and district commercial, plant and traffic superintendents, superintendents of construction, maintenance, and buildings and supplies, purchasing agents, supervisors of directories, and advertising managers.

Note.—The general manager shall be included in Group 1.

3. ATTORNEYS AND RIGHT-OF-WAY AGENTS.—Include under this head employees regularly engaged in legal work on behalf of the company, those engaged in negotiations with official public bodies and individual or corporate property owners for the purpose of securing right-of-way privileges, tax attorneys, tax agents, etc.

Note.—The administrative head of the legal department shall be included in Group 1.

4. ENGINEERS.—Include under this head employees engaged in the supervision of the engineering work of a departmental or territorial unit, and those who direct surveys or field work, prepare designs, plans, estimates or specifications, or make technical studies and investigations in connection with the development, construction, modification, maintenance, or operation of telephone plant; such as engineers of outside plant, engineers of inside plant, traffic engineers, building engineers, appraisal engineers, power and light engineers, fundamental plan engineers, division plant engineers, and district plant engineers.

Note.—The administrative head of the engineering department shall be included in Group 1.

5. DRAFTSMEN, SURVEYORS AND STUDENT ENGINEERS.—Include under this head employees engaged, in field or office, in elementary technical work in connection with the development, construction, modification, maintenance, or operation of telephone plant, such as chief drastmen, draftsmen, fieldmen, surveyors, rodmen, chainmen, and student engineers.

6. ACCOUNTANTS.—Include under this head employees engaged in directing the disbursement or revenue accounting of an entire company or at an accounting center, and those engaged in directing or making audits or in special staff or research work in telephone accounting and statistics, such as auditors of disbursements, auditors of receipts, division auditors of receipts, division revenue supervisors, disbursement supervisors, chief traveling auditors, statisticians, and other special accountants.

Note A.—The administrative head of the accounting department shall be included in Group 1.

Note B.—Employees whose duties are primarily those of a bookkeeper or clerk shall be included in Group 7.

7. CLERICAL EMPLOYEES.—Include under this head employees engaged in or supervising general or specialized office work (other than that performed by employees incidentally to their principal duties as indicated by the other groups herein established), such as cashiers, paymasters, bookkeepers, chief clerks, clerks, clerical students, stenographers, typists, messengers, and office boys, etc.

Note.—Helpers, apprentices, junior workmen, and other students undergoing specific training, should be classified in accordance with the character of the work for which they are being trained.

8. LOCAL MANAGERS.—Include under this head employees engaged in the supervision of, and responsible for, either the commercial or the entire work in the territory covered by a local office, such as managers, commercial managers, and nonfunctional or combination managers.

9. COMMERCIAL AGENTS.—Include under this head employees engaged in soliciting, outside collections, and other commercial work of a similar character usually performed outside of the company's offices, such as chief commercial agents, commercial agents, chief contract agents, contract agents, soliciting agents, directory advertising agents, chief collectors, outside collectors, and adjusters.

10. EXPERIENCED SWITCHBOARD OPERATORS.—Include under this head all experienced employees engaged in operating or supervising the operation of switchboards or similar auxiliary apparatus, and those in immediate charge of the training school for operators or engaged in giving instructions to students in

operating methods, practices, and rules, such as chief operators, supervisors, operators, public telephone attendants, private branch exchange operators, chief instructors, and instructors.

11. Operators in Training.—Include under this head all employees who are taking the school course for operators, also all operating-room employees engaged in operating switchboard or similar auxiliary apparatus, but who are not classed as experienced operators.

12. Service Inspectors.—Include under this head employees engaged in investigating and adjusting service criticisms and in making special service tests and inspections at subscribers' premises and at central offices, and those engaged in making and recording routine detailed service observations, such as traffic inspectors and service observers.

13. Supervising Foremen.—Include under this head employees who have immediate charge of unit or gang foremen engaged in the construction, installation, modification, or maintenance of telephone plant, such as general foremen, chief equipment foremen, chief installation foremen, chief line foremen, chief foremen of cablemen, chief foremen of cable splicers, and chief foremen of subway construction.

14. Central Office Installation and Maintenance Men.—Include under this head employees engaged in installing or directing installations of central office equipment, those engaged at central offices in making tests of plant and equipment or in the maintenance of central office equipment, or in immediate charge of such test and maintenance forces, and those engaged in inspecting central office equipment, such as central office installation foremen, central office installers, wire chiefs, test board men, equipment men, automatic and semiautomatic switchmen, central office repairmen, and central office inspectors.

15. Line and Station Construction, Installation and Maintenance.—Include under this head employees engaged in the construction, modification, and maintenance of aerial plant, including those in immediate charge of this work and those engaged in its inspection, those engaged in installing station or private branch exchange equipment or in immediate charge of this work, and those engaged in repairing station and private branch exchange equipment and the repair of aerial plant incidental thereto, together with employees at small exchanges who, in addition, repair central office equipment and install station equipment, such as line foremen, linemen, climbers, groundmen, troublemen, line inspectors, station installation foremen, P. B. X. and P. A. X. (private automatic exchange) foremen, station installers, P. B. X. and P. A. X. installers and installers' helpers.

Note.—Where an employee is assigned both to line and station work and to cable and conduit work, he should be classed in accordance with the preponderating character of his work.

16. Cable and Conduit Construction and Maintenance Men.—Include under this head employees engaged in the construction, modification, or maintenance of underground conduit, the placing, rearrangement, or removal of underground, house, block, or submarine cable, or the testing or splicing of cable, and those in immediate charge of one or more phases of this work, such as conduit foremen, masons, masons' helpers, tile layers, concretemen, conduit laborers, paving foremen, pavers, cable foremen, cablemen, splicing foremen, splicers, and splicers' helpers.

17. All Other Employees.—Include under this head employees not provided for in other groups, such as nurses, matrons, teamsters, chauffeurs, yard, shop, and miscellaneous foremen, storekeepers, stable and garage men, shopmen, janitors, porters, watchmen, elevator operators, cooks, waitresses, dishwashers, directory carriers, miscellaneous laborers, etc.

Grouping of classes of employees for annual reports of telephone companies to Insterstate Commerce Commission.

Gr. No.	Class A Companies. Title.	Class B Companies. Title.	Class C Companies. Title.
1	General officers and assistants.	General officers and assistants.	Officers and operating heads.
2	Operating officials and assistants.	Operating officials and assistants.	
3	Attorneys and right-of-way agents.	Attorneys and right-of-way agents.	Attorneys, engineers, and accountants.
4	Engineers.	Engineers, draftsmen, surveyors, and student engineers.	
5	Draftsmen, surveyors, and student engineers.		
6	Accountants.	Accountants.	
7	Clerical employees.	Clerical employees.	Clerical employees.
8	Local managers.	Local managers.	Local managers and commercial agents.
9	Commercial agents.	Commercial agents.	
10	Experienced switchboard operators.	Experienced switchboard operators.	Operators and service inspectors.
11	Operators in training.	Operators in training.	
12	Service inspectors.	Service inspectors.	
13	Supervising foremen.	Plant construction and maintenance men.	Plant construction and maintenance men.
14	Central office installation and maintenance men.		
15	Line and station construction, installation, and maintenance men.		
16	Cable and conduit construction and maintenance men.		
17	All other employees.	All other employees.	All other employees.

Specifications for maps, charts, and schedules which shall be filed with the Interstate Commerce Commission to support the valuation of telephone and telegraph property of steam railroads, properties of telegraph and cable companies, and "toll" or "long distance" properties of telephone companies.

Effective August 1, 1917.

I. GENERAL

1. *Intent.*—In order that the Interstate Commerce Commission may investigate, ascertain, report, and record the value of the telephone and telegraph property of "steam railroads," the property of telegraph and cable companies, and the toll or long-distance properties of telephone companies, as such properties may now exist, and as they hereafter may be extended, improved, or changed, it is essential that certain maps, charts, and schedules shall be prepared by the owner or operator of such properties, and that copies of same be filed with the commission as hereinafter specified.

All maps, charts, and schedules must be furnished upon sheets of the standard sizes, and of materials of the kind specified, and they must be produced or reproduced by the processes specified, and as hereinafter described.

2. *Record of Property Jointly Owned.*—Where property is jointly owned but one copy of the maps, charts, and schedules hereinafter required need be prepared or filed. If such maps, charts, and schedules are not verified by both parties the party not verifying shall file with the commission a statement that it adopts the same.

II. MAPS, CHARTS, AND SCHEDULES REQUIRED AS PERMANENT RECORDS

3. *Classes and Titles.*—The maps, charts, and schedules which shall be made are classified as follows:

(*a*) Index or route map.
(*b*) Terminal map.
(*c*) Circuit chart.
(*d*) Pole diagrams.
(*e*) Land schedules.

4. *Description and Purpose.* (*a*) *Index or route map.*—An index or route map shall be made for each State and shall show the general extent of the property and such other data as hereinafter set forth.

(*b*) *Terminal map.*—A terminal map shall be made in all cases where the property is of such an extensive or complicated nature that it can not be shown in the proper detail on the index map. The Director of Valuation may require by written notice or not less than 60 days the filing of a terminal map in any case.

(*c*) *Circuit charts.*—Circuit charts shall be made, when required by the Director of Valuation, on 60 days' notice, showing diagrammatically the wire circuits.

(*d*) *Pole line diagrams.*—Pole line diagrams shall be made showing the location of wires on the poles.

(*e*) *Land schedules.*—Land schedules shall be made describing all rights of way and lands of the reporting company.

III. MATERIALS.

5. *Cloth.*—All permanent record maps and charts shall be made by hand on the best grade of tracing cloth (Imperial or its equal).

6. *Ink.*—The ink used shall be the best grade, black, waterproof, and permanent india or printer's ink.

7. *Custody.*—When completed, the map or chart shall be kept by the carrier in some fireproof receptacle, subject to the inspection of the Commission. The carrier shall furnish to the Commission, from time to time, such reproductions of the same of the character hereinafter described, or as may be specified by the Commission.

IV. FORM OF MAPS, CHARTS, AND SCHEDULES

8. *Size of Sheets.*—(*a*) *Index or route maps* (*b*) *Terminal maps* shall be made on sheets 24 by 56 inches (23 by 55 inches inside of border line). A clear space 1 inch wide inside the border shall be left on the left-hand 23-inch edge for binding purposes.

(*c*) *Circuit chart.*—Circuit charts shall be made on sheets same size as route map, except that companies having circuit charts on other sizes shall not be required to remake them to comply with this requirement, but when making new charts or

redrawing present charts they shall be made to comply with the requirements as to size of sheets.

(*d*) *Pole diagrams.*—Pole diagrams of the sizes at present in use by the carriers are not required to be changed. Uniformity in size of pole diagrams covering complete systems is recommended. If carrier has not existing pole diagrams, the Commission, on request to the Director of Valuation, will furnish copies of approved diagrams.

(*e*) *Land schedules.*—Land schedules of right of way for pole lines, conduits, or submarine cables shall ordinarily be prepared on 8½ by 11 inch sheets as per sample attached.

Land maps shall also be made when needed as hereinafter set forth.

9. *Scales.*—The index or route maps shall be made on a scale of 1 inch equals 8 miles or less for territory east of Denver and 1 inch equals 15 miles or less for territory west of Denver. When maps are available such scale shall be used as will permit the showing in detail of the location of principal towns or offices and natural objects of significance, such as the larger streams, etc. The terminal map shall be on such a scale as may be available from existing city maps, but in no case shall be of a scale smaller than 1 inch equals 400 feet.

10. *Arrangement of Data.*—(*a*) *Index or route map.*—Where the property in a State can not be shown on one sheet, two or more sheets shall be made and the data so arranged as to require a minimum number. Where more than one sheet is required match marks shall be made on all sheets.

(*b*) *Terminal map.*—The data shall be arranged in such a way as to show the maximum amount of property within the limits of a sheet, except that property constructed under terms of a contract with a particular railroad company or railroad system shall be shown on separate sheets.

(*c*) *Circuit chart.*—Data on circuit charts shall be arranged in the manner most convenient in accordance with the present practices of the carriers. It is required that circuit charts covering lines of railroad companies or railroad systems shall show all of the telegraph and telephone wires on that system whether constructed by the telegraph or telephone company under contract with the railroad company or constructed by the railroad company, either under, or not under, the terms of such contract, except that it is not required that short pony wires or short yard circuits shall be shown on the circuit chart.

(*x*) *Combination of data on sheets.*—Where the number of sheets can be reduced by so doing, data of classes (*a*), (*b*), (*c*), (*d*), (*e*) as classified in paragraph 3 may be combined on the same sheet.

11. *Indexing.*—Ordinarily an index map will be made for each State, but two or more States may be shown on one map whenever that is the more convenient. If more than one sheet is required for a State the sheets shall be numbered consecutively, beginning with 1.

Terminal maps shall be indexed by States and numbered, beginning with 1. For example, terminal maps in the State of Alabama shall be indexed Ala—T—1, etc.

Circuit charts and pole diagrams may be indexed in accordance with present practices of carrier.

Land schedules shall be indexed by States and numbered consecutively for each line.

12. *Lettering.*—The lettering on all maps, charts, and schedules shall be in plain simple style.

13. *Title.*—The title shall be placed as near the lower right-hand corner as practicable. The following information shall be given therein:

(1) Class or classes where combined.
Index map (I).
Terminal map (T).
Circuit chart (C).
Pole diagram (P) (when combined with other data).
Land schedules (L) (when combined with other data).
(2) Corporate name of owner or owners.
(3) Name of operating company (if different from owner).
(4) Scale or scales (index and terminal maps only).
(5) Date of valuation.
(6) Office from which issued.
(7) Explanation of symbols used.

Where the same symbols apply to all sheets of a series, explanation of symbols need be placed on only one sheet of the series, preferably on sheet 1 of that series.

The use of symbols as given in "Instructions for Field Work of the Telephone and Telegraph Branch of the Engineering Section" of the Division of Valuation of the Interstate Commerce Commission is recommended where practicable, except that it is not required that present maps, charts, or schedules be remade to comply with this requirement.

True north shall be shown by arrow, head of arrow pointing north.

(8) Certification in following form:

Sheet ( ) of a series of ( ) sheets.
Certified by .....

14. *Certification.*—A certificate of the correctness of all maps and charts shall be printed and executed on the first sheet of each series. Such certificate shall be placed as near the title as practicable and shall be in the following form:

State of .....
County of .....
I, or we, the undersigned, ..., of the
(Title)
....., do hereby certify that this
(Name of company or companies)
assemblage of (maps or charts), consisting of ..... sheets, each bearing the autograph certificate of ....., of the property ....., has been pre-
(Name of company or companies)
pared from the records of said company or companies and is correct in form and substance.

(Name) .....,
(Title)
.....
(Title)

Subscribed and sworn to before me this ..... day of ....., notary public in and for the country of....., State of .....

My commission expires .....

V. DATA REQUIRED.

15. *On the Index Map.*—(*a*) *Alignment data.*—The route indicated by a single heavy line (or code lines), of the telegraph or telephone property along a particular rail carrier, with the name of such carrier, or upon a highway or private right of way, described by the towns reached or otherwise.

(*b*) *Governmental lines.*—State and county lines.

(*c*) *Topography.*—Topographical data, such as location and names of cities, towns, important water courses, railways, and such other data usually found on State maps as will assist in locating and identifying the property.

In congested districts it is recommended that the different railroads be shown by "code" lines, and it is not desired that topographical data be placed in such detail as to make it difficult to readily distinguish the "alignment data."

(*d*) *Indexing data.*—Points covered by terminal maps shall be shown by a circle on the index map, placing in the circle reference to terminal map number. Where not practicable to place the circle in exact location on the index map, it may be placed at one side, with arrow from circle to exact location.

Short loops from main line to offices or stations may be indicated as above, placing in the circle the symbol L and length of loop in miles, thus (L—25).

Short or unimportant loop or branch lines may be shown in detail on sheets same size as, and furnished with pole diagrams.

Important branch lines shall be shown on terminal maps.

16. *On Terminal Maps.*—Show: In general, extent and character of property, in detail, indicated on the map in true posititon by scale; also boundaries of streets and alleys on which property is located and such adjacent streets and alleys as will assist in locating and identifying the property; location of commercial offices, shops, repair and storage yards, and lands owned by metes and bounds with dimensions, areas, and reference to title record. Indicate true north by arrow, head of arrow pointing north.

17. *Circuit Charts.*—Circuit charts shall ordinarily show in diagrammatic form (not to scale) the principal terminal and test offices and other commercial offices, the points of beginning, and termination of circuits, together with the circuit number—size, material, and gauge of the wire or wires composing the circuit, and such other details of a permanent nature as the carrier requires for its own purposes. The details of connection of wires into or through terminals and other offices are not required by the Commission.

18. *Pole Diagram.*—Pole diagram shall ordinarily show:

Route or desigation of line.

Beginning and termination of section covered by diagram, indicated by pole numbers, mile posts, or stations or towns.

Length of section in miles to nearest tenth of a mile or nearest hundredth where possible.

Principal physical characteristics of poles, cross arms, and fixtures.

Location of wires on pole line structure, together with circuit or wire numbers and material and size of wires.

Ownership of wires, cross arms, and fixtures when owned by company other than the reporting company.

Date of construction when known.

Such other information as may be placed thereon for the use of the reporting company.

19. *Land Schedules.*—Schedules shall be prepared showing the lands and right of way of the carrier as follows:

(1) A list of rights of way upon the land of railroads. This schedule should give the name of the railroad, the points between which the right of way of the telegraph or telephone company extends, and should state the consideration, if any, paid for same. If the right of way is a matter of written contract, a copy of the contract should be filed.

(2) A list of rights of way along public highways. This should state the points between which the line extends and should give the consideration, if any, which was paid for the privilege. If the right was conveyed by ordinance or franchise, reference to same should be made. If any consideration was paid for the same, that should be stated, together with the amount.

In States where the use of the highway for telegraph or telephone lines require not only the granting of such right by ordinance but also the consent of the abutting property owner, both such facts and costs shall be shown separately with proper cross reference.

(3) A schedule of rights of way across private property. This should give the extent of the use by some proper description and should state the consideration paid for the use. The term should also be given.

(4) A list should be made of all lands of the carrier, distinguished from mere rights of use. If, for example, the carrier owns a strip of land upon which its line is maintained, that should be scheduled as land.

(5) Maps should be furnished showing the lands and buildings of the carrier when information as to size and character of same can be best conveyed in this manner. For example, if the carrier owns a plot of land in a town or city a map showing extent and location should be furnished. If a building is owned, information as to size and character of the structure should be furnished.

(6) Information called for in paragraphs 1 to 4, inclusive, above, should be furnished on 8½ by 11 inch schedules, as per form attached when applicable. Where this form is not applicable, carriers may prepare such special forms of the same size as are best intended for the purpose, supplementing same where necessary by maps, drawings, or photographs on the same size sheets.

Information called for in paragraph 5, above, may be shown by inserts on the terminal maps covering that location.

The Study of Engineering

The following editorial published by the Chicago *Tribune* on August 2 was intended to give the general public the information created by the Society for the Promotion of Engineering Education. The *Tribune's* editorial is a typical example of the layman's idea as to interpretation of conditions in the engineering profession. It would be much better to secure students of engineering through facts and gain students who will eventually make good engineers, rather than to secure great numbers of "prosperity seekers" through misrepresentation.

STUDY ENGINEERING

Hardly more than half the usual number of young Americans are now enrolled as students of engineering, whereas there should be twice the usual number, for the larger part of the civilized world will have to be reconstructed after the war. Industrial plans, bridges, railroads are going to rack and ruin even when they escape destruction. War overworks them and prevents repair. If the war lasts two years even America will have felt the strain. The demand for engineers will greatly exceed the supply.

We shall be unable to import them. When war broke out practically all the engineering schools abroad shut down, and engineers in Europe have since been slaughtered wholesale. Instead of our relying on Europe, Europe hopes to rely on us. As things look at present it is a forlorn hope.

The society for the Promotion of Engineering Education recently went over the whole question at its meeting in Washington. Several remedies are suggested. One would discourage enlistment among students of engineering. Another would put those who are drafted in the engineering corps. Still another would provide government aid for young men willing to enter a technical school. The more practical suggestion and the one easiest to apply is the call for proselyting. Tell every boy of your acquaintance that engineering will be the best paid profession for at least ten years after the war. That is the truth. Make him see it. Any lad with the requisite gifts will find the technical school an open door to success and prosperity and incalculable usefulness.

Isham Randolph, second vice-president of the American Association of Engineers, sent to the *Tribune* the following answer to its editorial:

In your issue of August 2 you have an editorial headed "Study Engineering" in which you tell of the existing need of engineers, due to the great demand which the war has made upon our profession, and you point to the inevitably greater demand upon America for engineers to repair the destruction wrought by war in Europe, a demand which cannot be met by the sons of that soil because of the drain upon the youth of the land, and the practical suspension of technical education; and to the European demand for trained engineers would be added that of our own land due to the development of new industries and to the necessity of rehabilitating utilities overtaxed by the demands of war.

All of this is well presented, but one sentence near the close of the article needs qualifying, viz: "Tell every boy of your acquaintance that engineering will be the best paid profession for at least ten years after war." That sounds too optimistic to us who have borne the heat and burden of long years of ill-paid service. We, who know that the engineer is generally regarded as a necessary nuisance, who has barely been granted a living wage; we who know that there are engineers whose education has cost them thousands of dollars; men who have mastered the science and whose compensation for knowledge, experience and faithful work is on the scale of wages paid to barely skilled labor, can hardly believe that even war will bring him into his own.

Your closing sentence has in it a qualifying clause which is timely, viz: "Any lad with the requisite gifts will find the technical school an open door to success, prosperity and incalculable usefulness." "Requisite gifts." Stress those words. What are the requisite gifts? Are they not the sound mind in the sound body; the ability to master mathematical science and the horse sense to apply that science to the problems which confront the engineer in varying form; the ability to labor conscientiously and untiringly; loyalty to duty and a just consideration for the rights and sensibilities of others?

With "these requisite gifts" of mind, body and heart "incalculable usefulness" is before the young engineer and perhaps "success and prosperity."

Telephoning from Moving Train

Successful experiments with a telephone apparatus installed on a railroad car were carried out by a representative of the signal department of the Canadian Government Railways and the inventor of the device, the former in the car itself and the latter in the dispatcher's office in the Moncton yard. The transmission in this system of communication is made through wheel and axle without the assistance of any contributing medium.

Reports of the tests declare that the communication established was in every way satisfactory, although the train was in motion. It is said there was no difficulty in hearing distinctly every word of the messages exchanged.

The experiment was tried on a double-track line where the rails are properly "bonded" for the block-signal system, but it is claimed that equally good results can be obtained on any track where the rails are similarly "bonded" without regard to the presence of a block-signal installation.

Trade Commission's Investigation

The Federal Trade Commission's investigation into the cost of producing copper, under supervision of Commissioner Colver, is progressing favorably. Dr. L. H. Haney is in direct charge of the details of this phase of the commission's investigation of metal costs. The field reports are now coming in rapidly and the commission hopes to have all reports in and results ready for submittal to the President very soon. None of these figures will be given out at the commission. If given out at all they will be made public at the White House.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

Massachusetts

ANNOUNCEMENT by the New England Telephone and Telegraph Company August 17 that no more private or commercial telephones will be installed until further notice, probably during the war, is up for investigation by the Massachusetts Public Service Commission.

William H. O'Brien, chief of the telephone and telegraph department of the commission, considers that the telephone company is assuming a good deal in cutting off new subscribers in such a wholesale manner. Mr. O'Brien says:

The question of telephone service is vital both to the business and social community, and any suggestions of denying that service in this age ought to be seriously inquired into.

As I understand it the Public Service Commission has power to inquire into the practices and the standard of service of the telephone company, and also into this question of the stoppage of service.

Failure to install new telephones has perhaps been justified because of lack of materials, but to wipe out all new telephone service is quite a different thing, and I believe the commission is authorized to look into it.

The company's ruling means:

1. No new residence telephones.
2. No new business telephones.
3. No applications for exchange service or facilities accepted "except where it is required in the general interests of the public."
4. No re-connection of telephones disconnected during summer absences.
5. No new extension services.

The company says the government emergency work must be met. It asks subscribers and the public to be patriotic. The official statement is as follows:

It has been found necessary to conserve our present facilities and supplies in every way possible because of the most unusual conditions existing today. We are confronted with not only an extremely limited but also with a very irregular source of supplies.

These conditions would have existed a year ago if we had not anticipated the emergency. We have built in advance telephone plants, both inside and outside, of all kinds, such as central office buildings, switchboards, cables, toll lines and other accessories. We arranged in advance for all sorts of material as long as it could be obtained.

Our engineering forces have developed in advance substitutes to take the place of many materials now impossible to secure and they have also improved construction and maintenance methods to effect savings in these lines.

The present critical conditions in this country have imposed a very unusual strain in furnishing unprecedented telephone facilities required by our government, not only in connection with our extensive military operations, but with the mobilization of the resources of the nation. In spite of all that has been done to anticipate present conditions the general demand for men, the general conditions of the raw material market, and the difficulty with transportation facilities are such that it is practically impossible to obtain our different kinds of plant supplies at the proper time and way so that we could put them together to take care of our unusual growth.

It would be very unpatriotic, under such conditions, almost criminal to dissipate our existing resources for regular commercial purposes until sure that the ultimate needs of the government and the public have been properly and positively provided. Although our foresight and resourcefulness have so far enabled us to maintain our regular commercial service of all the requirements, under the present situation, the future needs of the government and the public welfare are obviously not properly and positively provided for.

We are obliged to avoid new construction not directly associated with the war, and to conserve our existing resources in every way possible. This makes it necessary to postpone accepting applications for exchange service and facilities of all kinds, except where it is required in the general interests of the public. We want to be in a position, at all times, to take care of the service which is in any way concerned with governmental work, railroad companies, the municipal, state or federal government, or service necessary on account of extreme sickness.

It is only after most careful consideration that this step has been taken and we hope the postponement of this service will not be for long. I believe every patriotic citizen will appreciate the conditions under which we are trying to meet the situation.

Ohio

The public Utilities Commission of Ohio has submitted to Mayor F. W. Biehl of Galion a complete statement as to the valuation of the telephone companies of the city, and Mayor Biehl has submitted the statement to Secretary Manzer of the Chamber of Commerce.

Nearly a year ago the receivers of the Central Union Telephone Company and the officers of the Galion Telephone Company, both of which have exchanges in Galion, presented a petition to the state utilities commission requesting permission to consolidate or merge their interests and exchanges. It was proposed that the equipment and good will of the Central Union Company be purchased by the Galion Telephone Company, and together with a petition for the merger there was submitted a new schedule of rates, somewhat higher than those now in effect.

The utilities commission thereupon took up the matter of placing a valuation on the properties of the two companies, a tremendous task which required months and many men to complete. Inventories had to be made of all the property and some of the men were stationed in Galion for quite a while in order to perform this work.

The figures as submitted by the utilities commission give the reproduction value of the two concerns as $130,536.75. From this is deducted 32.3 per cent, or $42,116.32, leaving the present value at $88,420.43. The valuation includes right of way, land, buildings, wire, cable, local and toll, and general equipment, office furniture and other items, making a total valuation of $107,261.09. The cost of the preliminary reorganization, general and legal, is fixed at $1,716.18, cost of reproduction, $13,729.42, working capital, including supplies, $3,861.40.

Some time after the petition was filed by the two companies, an organization of farmers and others filed a protest against the rate proposed to be charged on country lines. Several meetings were held last winter and arrangements made to attend a hearing at Columbus at the proper time, but since then nothing further has been done.

Unless objection should be filed, it is assumed that the valuation as fixed will be accepted, the schedule of rates will prevail and the merger take place. While it is not known just what action will be taken by the subscribers of the two companies, it may be stated that there will be a general demand that the new company will be expected to equip the exchange here with the new and latest apparatus and material throughout.

Mayor Bell of Piqua has received a communication from the Ohio State Utilities Commission stating that the commission had completed the appraisal of the kinds and classes of property of the two telephone systems and the report would be filed immediately.

Thirty days must elapse before permission for the merger can be granted. In this time subscribers and both companies may file petitions or complaints against the proposed merger. The local chamber of commerce has been in constant touch with the situation and made repeated urgings and inquiries in interest of the subscribers, 97 per cent of whom have signified their willingness to have the merger effective by promising to pay the increase rate made necessary by it. Petitions asking for earliest possible action recently installed by the chamber of commerce in certain public places for signatures of the users, will be mailed to the commission as an argument for granting the merger.

The office equipment of the Central Union Telephone Company in the entry was valued at $6,093 for the real valuation. The representative valuation was $13,425, the difference being allowed for depreciation on the equipment. The total physical property valuation is $178,816 for the representative valuation and $119,780 as the present valuation. The grand total valuation at present is $151,006.

Definite action of the utilities commission probably will be taken on permission for the merger the week of September 23.

Asserting that the service provided by the Cleveland Telephone Company is inadequate and that it "is so poor as to cripple business firms," Councilman Clayton C. Townes announced he will start a movement to bring Ohio public utilities commission officials to Cleveland to standardize calls.

Townes pointed out that the Wisconsin public utilities Commission has fixed eighteen seconds as the standard for obtaining responses from persons sought at the other end of the telephone.

Such a standard never has been fixed for Cleveland. Townes asserted an average of twenty-five seconds for obtaining calls would be reasonable, and he will fight for that.

"My investigation has disclosed that the Cleveland Telephone Company would have to expend $800,000 for needed equipment to bring the service up to where it should be, and that is more than officials of the concern are willing to expend," said Townes. "An investigation by the utilities commission affords the means for needed relief."

Townes asserted he has been deluged with complaints about the service. Delays in getting responses range, he said, from ten seconds to ten minutes.

Application was made to the public utilities commission for an order authorizing the Home Telephone Company of Chillicothe to buy property of receivers of the Central Union Telephone Company, located in Chillicothe, Bourneville, Richmondale and that vicinity. The purchase price is $41,000.

In the application, the Home company says it is making preparations for extensive telephone service for Camp Sherman, the military contonment at Chillicothe. The commission ordered an inventory of properties to be completed and filed by November 1.

The Cincinnati and Suburban Telephone Company has filed an application with the state utilities commission, asking for approval of the issue of $1,716,650 additional capital stock. The company has an authorized capital of $12,000,000, but only $8,283,350 has been issued. The new stock is to be sold at par and the money used for the purpose of making improvements, betterments and extensions to the property.

California

A joint application of the Southern California Telephone Company and the Pacific Telephone and Telegraph Company for authority for the former to issue and credit to the latter $737,100 par value of common capital stock has been filed with the State Railroad Commission.

On November 4, 1916, the Railroad Commission authorized the Southern California Telephone Company to acquire the properties of the Home Telephone and Telegraph Company of Los Angeles and the Los Angeles local exchange properties of the Pacific Telephone and Telegraph Company. The transfer of these properties was made as of December 31, 1915.

From the date of the transfer to April 30, 1917, the Home company, the application states, made net additions and betterments to its plant costing $285,817.20, while the Pacific company made net additions and betterments to its plant costing $320,237.74. The Home company also reports that on April 30, 1917, it had accounts receivable valued at $38,940.53 and the Pacific Company $92,173.97.

The interest in the net additions and betterments and accounts receivable of the Home company has been transferred to the Pacific company, which now asks that the Southern California Telephone Company be authorized to issue to it in exchange for the net additions and betterments and accounts receivable of the Home company and the Pacific company, $737,100 par value of common capital stock.

The Pacific States Telephone and Telegraph Company and the Pacific Telephone and Telegraph Company have filed with the Railroad Commission an application authorizing the Pacific States Company to convey all its rights in California to the Pacific Telephone and Telegraph Company. The Pacific States Company, until 1907, operated the general system, now conducted by the Pacific Telephone and Telegraph Company, but since that date has not been actively in any business, nor does it own any property in California but rights of way, which are what it proposes to transfer for a nominal sum.

District of Columbia

The Public Utilities Commission of the District of Columbia is in receipt of several complaints concerning the service given by the Chesapeake and Potomac Telephone Company during the past few months.

It is understood that the general feeling in this case at the headquarters of the Public Utilities Commission is that the immense demand for service on account of the war emergency in the government departments here, has drawn so heavily on the facilities afforded by the company that the force employed is unable to handle the business.

No blame whatever is attached to the telephone company for the lack of speed in connecting parties at different periods of the day, but much more is given to the public, which is using the telephones unnecessarily and not considering the precedence which should be given to a government during the time of war.

Alabama

The Birmingham telephone rate case, after suffering quite a number of postponements of hearing before the Alabama Public Service Commission, has been again postponed, and this time for an indefinite period. The case was set for hearing in Birmingham Septembmer 18. At the request of Monte Ullman, city attorney for Birmingham, the last postponement was made.

The city attorney advises that he is a member of the exemption board of Birmingham and is so busily engaged it will be impossible for him to handle the rate case.

Indiana

The Indiana Public Service Commission authorized the Indianapolis Telephone Company to issue $1,000,000 worth of 6 per cent five-year notes to be sold no lower than 95 per cent of par. The money will be used for betterments and buying new properties.

Illinois

Last February McFadden & Co., of Havana, filed a complaint before the Public Utilities Commission to the effect that the Citizens Telephone Company refused to give the McFadden company Bell service to Peoria, but gave service over its own toll lines instead, and that the service rendered was not so prompt or so good as service over the Bell line would have been.

The Citizens company answered by saying that service over its line to Peoria was as good as service over the Bell line, and that the Citizens company ought to be allowed to use its own line when it could be done without injury to the patron.

A hearing on the complaint and answer was held at Springfield, April 4, 1917, Scott S. Nortrup appearing for the McFaddens and O. F. Berry for the Citizens Telephone Company.

The commission has just decided that the evidence was not strong enough to warrant a decision granting the specific relief asked for by the McFaddens. The decision concludes:

> The right of the originating company to designate the circuit or initial line is a privilege which is to be accorded only so long as it appears to be a just and rational policy, and it is not the intention of the Commission to establish any rule or recognize any vested right of the telephone utility in this matter, since those in control of public utilities must at all times proceed with due regard to the character of service to be furnished, and when the originating exchange is permitted to route a message, that routing should be done with as much dispatch as possible and with the least inconvenience to the calling party.
>
> After considering all of the evidence submitted in this case, the Commission feels that it is not justified in granting relief in the specific manner asked by the complainant, and that the complaint should be dismissed. The Commission feels, however, that some cause for complaint has existed and that the defendant should furnish to the complainant at all times, whether use is made of the defendant's toll lines or the toll lines of some other company with which it has physical connection, an adequate and efficient toll service.

The Belvidere Telephone Company has made formal application to the State Utilities Commission for permission to raise the rate on residence telephones in Belvidere $3 per year.

An increase of $3 per year for single line residence telephones means $2 per month, or $24 per year; on two-party lines it means $1.50 per month, or $18 per year.

Present rates are: Business telephones, $36; single line residence, $21; party line residence, $15; business extension, $12; residence extension, $6.

The telephone company bases its petition to be permitted to raise its rates upon the plea that much greater expense is entailed in operating the system because of increased cost of labor and materials.

The Montgomery County Telegraph & Telephone Company received an order from the State Public Utilities Commission to advance the rates of the company, the order to go into effect October 1.

The new rates are not announced.

Michigan

Advices from Lansing to Detroit officials indicate that the city's controversy with the Michigan State Telephone Company over metered service is likely to be settled by September 15, through a compromise plan under consideration by the State Railroad Commission.

Though members of the commission refuse to state their plans, it is understood they will order that metered service be installed temporarily to ascertain if this system will improve Detroit telephone service to the extent set forth by the telephone company. While metered service is accepted as meaning higher rates, the commission takes the position that the public is mainly interested in better service.

Further consultations will be held after September 1, when the commission resumes hearings. Commissioner A. A. Kaiser, of Ludington, who became legal and telephone expert on the death of Lawton T. Hemans, has been spending his vacation going over the mass of testimony taken in Detroit telephone hearings.

Missouri

Complaint was filed with the Missouri Public Service Commission by the Meissner Telephone Company of Jefferson county against the Union Electric and Power Company of St. Louis.

The Meissner company supplies telephone service to Beck, Kimmswick, Herculaneum, Sulphur Springs, Glen Park, Barnhart, Pevely and several other towns and villages in Jefferson county.

It is asserted the Union Electric Company is building a high-power transmission line through the territory occupied by the complaining company and is not taking the precautions necessary to prevent interference and injury to its lines.

The high-voltage current carried by the transmission line, it is claimed, will by induction render practically useless and dangerous to use the telephone lines.

The commission is asked to make an investigation and enjoin the Union Electric from constructing its transmission line in such a manner as will interfere with the wires of the telephone company.

Minnesota

More than 10,000 miles of telephone toll line will be valued by the engineering division of the Minnesota Railroad and Warehouse Commission within the coming year. After two weeks of preliminary instruction and coaching, three crews of practical telephone men are beginning to make a detailed inventory of the toll lines in Houston and Winona counties. Additional crews will be organized as soon as suitable men may be obtained, and it is expected that by fall nine or ten crews will be at work.

The utmost care is required of the field men in their work. Every pin on the cross-arms, every glass

insulator and the innumerable units of construction must be counted and reported. The size, quality and general condition of the wire must be noted. The size, height and general condition of all the poles, together with the kind and position of guys and anchors are required for the inventory; in other words, the detailed data required by the commission is almost unlimited and the work of gathering the information necessarily will be slow.

The purpose of this undertaking is to ascertain the value of all the telephone property in the state used for toll purposes, with a view of obtaining a basis for determining the reasonableness of the prevailing rates for toll service. The inventory figures will be compiled, the value determined by expert telephone men and statisticians and the final reports filed with the commission.

Commissioner Charles E. Elmquist accompanied a party to Winona in order to inform himself on the methods employed by the field crews in obtaining the information desired by the commission. D. F. Jurgensen, chief engineer of the commission, is in charge of the entire work, and will visit the crews from time to time to see that they are following the standards he has prepared.

The application of the Becker-Mahnomen Telephone Company for increased rates was heard at Detroit, Mich., on July 27. The telephone company seeks to increase its business rate and decrease its one party residence rate. At the request of the business men the company changed its system in Detroit from a local magneto to a common battery plant, and put the new service in effect upon the first day of August, 1917. This change was made at an expense of $15,592.48, of which $5,581.27 has been charged to the capital account. The plant is now in good condition and is giving its patrons excellent service.

At a meeting held by over 100 business men of Detroit on October 3, 1916, a resolution was unanimously passed requesting the company immediately to make the necessary changes in equipment so as to supply central energy service with efficient operators, and to increase its business rates to $2.75 net per month; decrease the private line residence rate to $1.75 per month net and decrease the business extensions to 50 cents per month net.

The office has been moved from the second floor to the main floor with an increased rental of $20.00 per month. There are six operators, and increased wages will amount to $22.50, figuring on a minimum wage of $35.00 per month. Maintenance charges have increased. A statistical examination develops that under the present rates the company would earn, less 6 per cent for depreciation, a rate of 3.33 per cent on its plant value, and under the proposed rates 4.49 per cent. The chief engineer of the company testified that the physical value of the plant is greatly in excess of the book value. The commission has not made a valuation of the property.

The outstanding capital stock amounts to $15,930.00, and there are also $27,000.00 in bonds bearing 6 per cent and $22,600.00 in notes issued at 5 and 6 per cent against the property.

The Tri-State owns a majority of the stocks of the local company. The money has all been invested in the plant, which includes the exchange at Detroit and exchanges at Galloway, Ogema and Mahnomen, with toll lines between these points and also toll lines extending northward from Mahnomen to Beaulieu and Winger and southwest from Detroit to summer resorts at Shoreham and Fair Hills. No separation has been made of the cost of constructing the separate exchanges or the toll lines.

On account of the shade trees on the streets and the absences of alleys, it has been necessary for the company to install a large amount of underground cable in Detroit.

After reviewing all the evidence and exhibits the commission is of the opinion that the application for increase should be granted.

It is therefore ordered that the Becker-Mahnomen Telephone Company be permitted to modify its present rate schedule for the City of Detroit in the following manner, and that when so modified the rates shall be regarded as just and reasonable maximum rates:

Business, Private Line	$3.00	per mo. gross
Residence, Private Line	2.00	per mo. gross
Residence, Two-Party Line	1.75	per mo. gross
Residence, Four-Party Line, Desk Set	1.50	per mo. gross
Residence, Four-Party Line, Wall Set	1.25	per mo. gross
Business Extension	.50	per mo. net
Residence Extension	.50	per mo. net
Intercommunicating Sets:		
Trunk Lines	3.00	per mo. gross
Hotel Private Branch Exchanges:		
Trunk Lines	3.00	per mo. gross
Rural Telephones:		
Residence, Multi-Party	1.25	per mo. gross
Business, Multi-Party	2.25	per mo. gross
Employes, Residence, Private Line	1.00	per mo. gross
Employes, Residence, Four-Party Line	1.00	per mo. gross

Rates for service not quoted above are not affected by this order. All rates to be billed gross, except where quoted net. All gross rates to be payable monthly in advance with a discount of 25 cents per month if paid on or before the 15th of the month in which the service is rendered, excepting connecting company rurals which rates are payable annually in advance, and except that company rural rates are payable quarterly with a discount of 75 cents if paid on or before the 15th of the first month of the quarter, a discount of 50 cents if paid on or before the 15th of the second month of the quarter, and a discount of 25 cents if paid on or before the 15th of the third month of the quarter.

The application of the Nevis Telephone Company of Nevis, Minn., to increase certain of its rates was heard February 28. The Nevis Telephone Company was incorporated March 24, 1910, being a consolidation of the North Nevis Telephone Company and the Southern Nevis Telephone Company, two small farm lines, which under the consolidation were connected and an exchange constructed in the village of Nevis. The company has grown until it now serves 58 local subscribers and 93 connecting rural subscribers.

The petitioner requests the following rates:

Business, One-Party	$24.00 per year
Residence, One-Party	12.00 per year
Connecting Rural Stations	3.00 per year

An appraisal of this plant made by the commission's engineering department, shows the present value to be $2,483.44. An examination of the records and accounts indicates that the rates petitioned for will be barely sufficient to properly operate and maintain the property and allow a reasonable charge for depreciation and return upon the investment.

It is therefore ordered that the Nevis Telephone Company be permitted to establish the following reasonable maximum rates for local exchange service at Nevis, Minn.

Business, One-Party	$2.00	per month net
Residence, One-Party	1.00	per month net
Connecting Rural Stations	3.00	per year net

This schedule to become effective the first day of September, 1917.

A petition of the Northwestern Telephone Exchange Company requests the commission to authorize and direct that it classify and charge for its service at its Northfield exchange in accordance with the rate schedule filed July 1, 1915. No change in the rates filed at that time has been authorized by the commission. A large number of the residence subscribers have been and are now receiving two-party service at the four-party rate.

The fact that a telephone company may be furnishing its subscribers with two-party service at the four-party rate might be strong evidence that the rate for two-party service is too high if complaint were made.

The rates for the several classes of service filed by the petitioner July 1, 1915, are the legal and published rates for local telephone service in the city of Northfield, and to furnish any service at other than the rates named in the schedule on file with the commission is unlawful, or to classify subscribers so as to permit their receiving telephone service at a lesser rate than quoted in the schedule is a discrimination as provided for in Chapter 152, Laws of 1915. The petition is therefore dismissed.

In the matter of the application of A. Buchanan et al., for physical connection between the toll lines of the Northwestern Telephone Exchange Company and the exchange of the Four Corners Telephone Company at Oakland, Minnesota, an examination of the petition and verified answer discloses that since the filing of the petition the Four Corners Telephone Company has entered into an agreement with the Interstate Telegraph & Telephone Company whereby the said company will take over the operation of the lines of the Four Corners Telephone Company. This represents an entire change in the operation, and hence the Four Corners Telephone Company is not in a position to satisfy the complaint.

It will be necessary for a new petition to be filed against the proper parties before the commission has jurisdiction to proceed with the case.

The answer also contains a petition signed by twenty-four of the original thirty petitioners in this proceeding requesting that their names be withdrawn from the original petition.

Under all these circumstances, the commission is of the opinion that the complaint should be dismissed, and the same is hereby ordered.

Oregon

The Public Service Commission of Oregon has handed down a decision against the Home Telephone & Telegraph Company of Portland, Ore., restraining it from placing a supplementary rate schedule in effect whereby no charge is made to new subscribers for residence telephones for the first three months' service. It was contended that by giving three months' free service to subscribers the company would be enabled eventually to increase its revenues without adding to its present expense of operation and without throwing any added burden on its present subscribers, and that new business could thus be procured at a much less expense. It was held by the commission that the inevitable result of such a practice would mean the practical annulment of the utilities act, permit the establishment of a method to stifle legitimate competition, bring ruin to the weaker utilities and in many cases bankruptcy to the one adopting such a method. The public is, therefore, vitally interested in preventing any practice which would in any way affect the financial condition of such a utility. Any utility which furnishes or offers to furnish service at free or reduced rates, or which makes any concession whasoever to new subscribers, not only violates both the letter and the spirit of the act, but subjects those to whom such service is furnished to severe penalty.

As the result of a complaint made to the Public Service Commission by E. D. Kingsley, president of the West Oregon Lumber Company, the Pacific Telephone & Telegraph Company is improving its service to Linnton by connecting that district up with its Columbia office. This will be done, the company informs the commission, by laying a submarine cable across the river from Linnton to St. Johns and an aerial cable from St. Johns to Columbia. The work will be completed in thirty days, the company says.

The War Tax Bill

The war tax bill is again before the Senate. After having been further amended by the Senate Finance Committee, the bill is being debated. It is subject to amendment.

Telephone companies are interested in the following provisions:

Tax on Toll Messages.—A five-cent tax on every toll message, the charge for which is 15 cents or over. This tax is to be paid by the subscriber. Monthly reports of toll business are required from the companies. No tax is imposed on telephone rentals.

Income Tax.—The revenue law of September 8, 1916, provides for a tax of 2 per cent on the net income of all corporations. The proposed bill adds 4 per cent to this tax, so that if the bill is passed as now being considered, the corporation income tax will be 6 per cent.

War Profits Tax.—All corporations having a net income of $5,000 or more are to pay a tax on the difference between the corporation's net income for 1917 and its average net income for the years 1911, 1912 and 1913 (known as the "pre-war period"), provision being made for increased capital invested. From the difference between the average net income and net income for 1917 there is allowed a deduction of $5,000 before the tax is computed. If the average net income of a corporation for the pre-war period was $6,000 and the income for 1917 is $8,000, the excess is $2,000. But no tax will be levied on this excess, since the excess has to be over $5,000 before it is taxable.

Few, if any, telephone companies will have a net income for 1917 exceeding the "pre-war period" income, additional investments being considered, so that it is thought none of our companies will be affected by this tax.

The excess profits tax law of March 3, 1917, is repealed.

Holding Companies.—Companies holding stock in other corporations that are subject to the tax will not be required to pay taxes on the dividends received on that stock.

Tax on Surplus.—A 10 per cent tax on any portion of the year's net income remaining undisturbed sixty days after the close of the year. This tax does not apply to the surplus that is invested in the business, or is retained for employment in the reasonable requirements of the business.

Stamp Taxes on Bonds, Stocks and Checks.—On bonds issued after a date to be fixed in the bill, 5 cents on each $100 of face value. On stock issues, 5 cents on each $100 of face value. On sales or transfers of stock, 2 cents on each $100 of face value. On promissory notes, 2 cents on each $100. On bank checks, 1 cent on each check. On proxies for voting for officers, etc., 10 cents on each proxy. On each power of attorney, 25 cents.

Postage Rates Increased.—An increase of 1 cent per ounce on all first-class mail except local drop letters. An increase of one-quarter of a cent per pound on all second-class mail, or a zone system of 1 to 6 cents a pound.

Information at the Source.—Instead of withholding the tax on amounts regularly paid by it to employes or stock or bondholders, a corporation is to furnish information to the government of all such payments of $800 or more per year.

The bill is a long one and somewhat involved, owing to the many references to the Act of September 8, 1916. A number of changes in this law are proposed, so that to understand the proposed law one must have at hand for reference the Act of September 8. Should any companies desire copies of the present law and the proposed law, the United States Independent Telephone Association will be glad to send them.

As soon as the new law is adopted by Congress full details will be sent to all companies by the association.

Moral Welfare Talks for Operators

A course of moral welfare lectures for Ohio State Telephone operators will be given at Toledo.

Herman Buxton, of the traffic department of the company, arranged for the first of a series of noon lectures on morals, health and dress. Mrs. Mary L. Simon, juvenile court officer, delivered the first talk to the operators.

This is the first venture of its character in the state, company officials say.

Pennsylvania Independents Meet

The Eastern Pennsylvania Independent Telephone Association held a very successful meeting at Allentown, Pa., in the territory of the Consolidated Telephone Company, on Thursday and Friday, August 9 and 10, 1917.

E. M. Prisk, general manager, and H. H. Weibel, advertising manager of the Consolidated Company, arranged for the entertainment of the members present on Thursday on an elaborate scale.

After an inspection of the Consolidated Telephone building, automobiles were provided and a ride of forty miles included a visit at the United States Ambulance Training Camp and a tour of the game preserve of Colonel Harry C. Trexler, after which a dinner was served at the Elks' Club and a splendid address delivered by Attorney Lawrence H. Rupp, of Allentown, Pa.

On Friday, at Odd Fellows' Temple, the association meeting was addressed by J. H. Cross, of Philadelphia, Pa., on the subject of "Advertising and Publicity." Mr. Cross has been requested to prepare a paper on the subject of advertising for the information of telephone men in general.

W. S. Vivian, secretary and treasurer of the United States Independent Telephone Association, addressed the meeting on general matters, and immediately following, Edward M. Prisk, general manager of the Consolidated Telephone Company, held a general discussion of matters relating to the construction, operation or maintenance of telephone exchanges and toll lines. This general discussion proved to be very interesting, and several questions were brought up, including the following:

Does it pay to solicit service complaints?

In view of the constantly increasing cost of dry batteries, has anyone present adopted a satisfactory method of testing cells to determine the remaining life.

Would it not be well to thoroughly instruct our toll operators regarding the importance of charging up overtime minutes?

How often should toll lines be inspected?

What is the best method to adopt in order to interest toll operators in properly using our new standard operating rules?

What companies here represented have recently increased rates, and how did they go about it?

After the transaction of routine business the association members, as guests of the Consolidated Company, participated in a luncheon served in the Banquet Hall of Odd Fellows' Temple.

Los Angeles Liquidation

The Home Telephone and Telegraph Company of Los Angeles has applied to Commissioner of Corporations H. L. Carnahan for authority to distribute assets as liquidating dividends to holders of its common and preferred stock to settle the indebtedness of the company and finally to distribute remaining assets. The company is availing itself of the opportunity offered by the amended civil code providing that the Commissioner of Corporations may grant authority to take such action.

The company received permission from the State Railroad Commission several months ago to sell its working plant to the Southern California Telephone Company, subject to a bonded indebtedness. It received from the latter concern $8,782,000 5 per cent bonds, of which $4,027,000 were transferred in trust, to be exchanged for a like amount of outstanding bonds of the Home Company.

It is now seeking permission to declare an accumulated dividend of $900,000 in cash, to be distributed to the holders of preferred stock; also to declare a dividend on $6,000,000 of its common and preferred stock in bonds of the Southern California Telephone Company, making a total of $4,500,000 to be distributed, at the rate of $75 per share.

Finally, the company desires a permit to distribute to its stockholders the assets remaining after all debts are paid.

Interfering Company Liable

Judge E. M. McCall filed his decision August 10 at Nevada, Iowa, in a case that will be of vital interest to public service lines all over the state, when he held that the Cedar Valley Hydraulic Company was liable for the cost of converting a grounded telephone line into a metallic circuit line. The case was submitted on an admitted statement of facts in vacation and was from Franklin county.

In cases where a high tension electric line is constructed along parallel to a telephone line which is a grounded line, such as the ordinary country lines are constructed, the service is impaired unless the telephone line is made a metallic circuit line. The case has previously been taken up by the railway commission but they divided on the question.

In the case in question the high tension had constructed their line alongside that of a small independent telephone company and the matter had been taken into the courts, the plaintiff seeking to recover from the high tension people the amount that it costs them to convert their line into a metallic circuit line.

Judge McCall holds that they are liable for the amount claimed, which amounts to but about $500. The question involved is the important point in the matter, however.

This case will doubtless be appealed to the supreme court and the matter will be decided, thus securing a supreme court opinion on an important question regarding public service lines and their rights.

Grand Forks Wants Interconnection

Replies from the Northwestern and Tri-State Telephone Companies relative to the request for their opinion, made by the city of Grand Forks, N. D., regarding the franchises held by the two local exchanges and the possibility of establishing a physical connection between the two lines, have been received by Alderman W. S. Whitman, chairman of the special telephone franchise committee.

The committee will take the replies up for discussion and prepare a report to be presented to the city council.

It is understood that the companies declare they hold perpetual franchises in Grand Forks. The companies are willing to co-operate with the city to establish a more efficient service is the general understanding and the telephone companies do not seem to be antagonistic to the proposed connection of the two lines.

The replies to the official request of the city were presented to Alderman Whitman by C. R. Bonner, local manager for the Northwestern Company, and C. W. Reese, manager of the Tri-State exchange.

Mistakes Cable for Trolley

While an interurban car was backing out of the Provo (Utah) Foundry & Machine Company's yard the trolley was accidentally switched onto a telephone cable of 200 wires, with the result that the cable was burned out. This caused several telephones in the west part of town and at Lake View and Vineyard to be out of commission for some time.

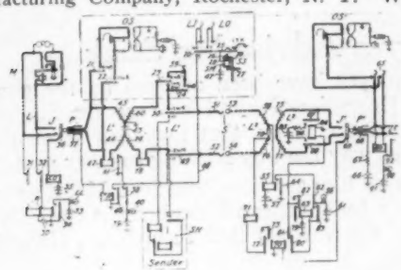
Telephone Patents Issued Recently

A Brief Digest of those Current Specifications Most Interesting to Telephone Men

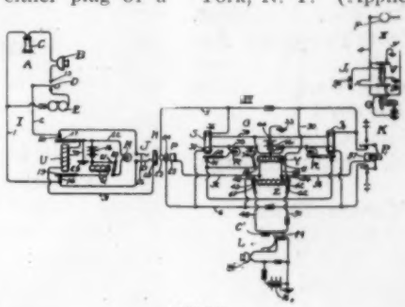
BY DAVID S. HULFISH

1,221,879. Trunking System. Issued to A. E. Lundell, assignor to Western Electric Company, Inc., New York, N. Y. When a call is answered by an answering plug, the first operator operates a callsender to select an idle trunk, after which a second operator has calling and release signals controlled by the first operator.

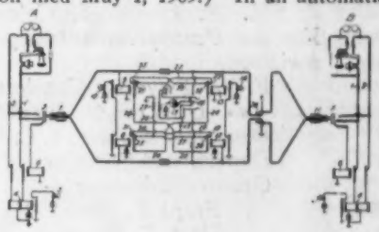
1,222,043. Operator's Listening-Relay Circuit. Issued to F. M. Slough, assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. When either plug of a cord pair is in a jack, the operator is connected to the pair, but when both plugs are in the listening circuit is broken.



1,221,879



1,222,043



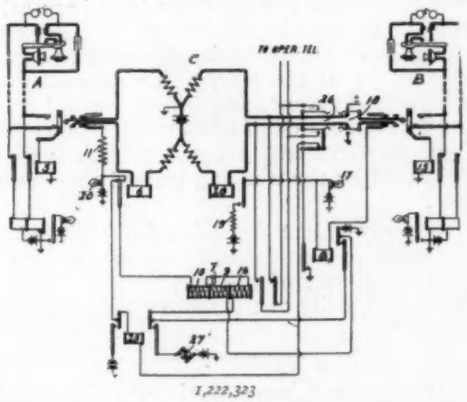
1,222,364

1,222,077. Fraud Detector. Isued to V. D. Cousins, assignor to American Telephone and Telegraph Company, Boston, Mass. The publication of this patent is an advertisement that the telephone coin collecting box therein shown can be defrauded. A central-office signal is arranged to detect attempts at certain fraudulent methods of controlling the coin-signal circuits.

1,222,151. Recording Coin Device. Issued to A. F. Sipperly, Denver, Colo. Coins deposited in a telephone collection box operate magnets to make records upon a record card in the box.

1,222,323. Recall Signal. Issued to Arthur Raynsford, assignor to Western Electric Company, Inc., New York, N. Y. When the calling subscriber operates his hook lever to call the operator back, a locking relay and a commutator keep his lamp flashing until answered.

1,222,364. Tone Circuit. Issued to H. P. Clausen, assignor to Western Electric Company, New York, N. Y. With the ringing plug not inserted in a jack and the operator not listening in, tone is given to the answering plug. The operator cuts in with her listening key before plugging into the answering jack, then tests for busy and then gives tone merely by cutting out with her listening key.



1,222,323

1,223,349. Call-Distributing System. Issued to F. W. Dunbar, assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. (Application filed December 30, 1904.) An automatic switch is situated between the lines and the answering jacks and connects a calling line to an idle answering jack. The patent carries 156 claims and its early date of filing makes it of interest.

1,223,369. Call-Distributing System. Issued to E. E. Clement, assignor to J. R. Garfield, trustee, Cleveland, Ohio. (Application filed August 18, 1905.) When a call is begun, several call-finders may search for it and their searching brushes are so controlled as to keep them spread over the lines of the group being searched. Twenty claims and twelve years in the patent office.

1,223,382. Callsender Locking System. Issued to C. L. Goodrum, assignor to Western Electric Company, Inc., New York, N. Y. (Application filed May 1, 1909.) In an automatic telephone system, the callsender at the telephone is locked against operation when the telephone is not being used and is unlocked for sending a call by current from the central office, the current being sent only when the central office is in readiness to receive a call.

1,223,506. Common-Battery Automatic System. Issued to T. G. Martin, assignor to Automatic Electric Company, Chicago, Ill. (Application filed April 9, 1906.) An early application upon the circuit and feed-relay arrangements used by the Strowger System. The patient has eighty-seven claims.

Telephone Installations in Yucatan

The telephonic equipment in use in the cities of Progreso and Merida, Yucatan, Mexico, are of an antiquated Norwegian make. The service is unsatisfactory and inconvenient.

Public sentiment is strong in its demand for a better service and two of the leading industrial and commercial organizations are installing temporary independent telephonic connections between their Progreso and Merida offices.

The time is opportune for American manufacturers of telephones to get in touch with the proper interests in Yucatan, some of whom have expressed their desire to receive correspondence and literature on this subject.

[A list of those interested can be had from the Bureau of Foreign and Domestic Commerce or its district or co-operative offices by referring to File No. 90790.]

Hull Corporation Telephones

At a recent meeting of the Hull Corporation (England) telephone committee it was announced that there was a surplus upon the working of the fiscal year 1915-16 amounting to £5,350 ($26,035). The chairman stated that £54,000 ($262,800) had been received in rentals; trunk fees had fallen off. He pointed out that the Hull telephone tariff was 33⅓ per cent less than throughout the rest of England, and that as the result of these moderate rates some £10,000 ($48,665) was saved annually to Hull subscribers. It was stated that the Hull Corporation had paid a total of £30,000 ($146,000) to the government in royalties.

Hull is the only district in the country in which the telephone service is owned by the local authorities.

Handling Independent Enlistments

Applications for enlistment in field battalions or the United States Signal Reserve Corps are wanted by the Independent associations, and Independent telephone men willing to do their part in the activities of the nation should call or write to the nearest representative on this list:

EASTERN DEPARTMENT

Chairman, E. D. Schade, Johnstown, Pa.
Secretary, H. E. Bradley, Philadelphia, Pa.
John H. Wright, Jamestown, N. Y., President Western Pennsylvania and New York Independent Telephone Associations.
H. A. Oberdorf, Columbia, Pa., President, Eastern Pennsylvania Independent Telephone Association.
F. W. Twyman, Charlottesville, Va.

CENTRAL DEPARTMENT

Department Chair, J. C. Kelsey, Chicago.
Department Secretary, W. S. Vivian, Chicago.
Group Chairman:
Frank L. Beam, Mat. Vernon, Ohio.
Hart F. Warwell, Terre Haute, Ind.
George W. Robinson, St. Paul, Minn.
Frank H. Woods, Lincoln, Neb.
A. F. Adams, Kansas City, Mo.

SOUTHERN DEPARTMENT

Chairman, J. B. Earle, Waco, Texas.
Secretary, E. C. Blomeyer, Waco, Texas.
Vice-Chairman, R. B. Still, Tyler, Texas, President, Texas Independent Telephone Association.

Suggests Tax Changes

Senator James Hamilton Lewis, from Illinois, has received a letter from R. W. Irvine, Centralia, Ill., which makes some suggestions worth considering about the telephone war tax. He says:

"On the new tax bills, according to the newspapers, telegrams and long-distance telephone calls, 5 cents each, telephone bills only 5 per cent.

"I belong to a club in St. Louis where we are charged 5 cents for local calls; 3 cents of this goes to the telephone company and 2 cents is profit to the club. I believe the same ruling applies on the hotels that make a 5-cent charge for calls from the booths in the lobbies, and double, or 10 cents, from one's room. In other words, they make a profit of 2 cents on every 5-cent call, and on the room calls a profit of 7 cents on a call.

"Yet, in framing the tax bills you are arranging for 5 cents on every long-distance call and only 5 per cent on local telephone messages. Why not arrange to tax the hostelries 1 cent on the 2-cent profit they make on the usual 5-cent call and charge them 6 cents on a local call? That would simply result in extra profit for the government and less for the clubs, hotels and other points, where this overcharge system has been in force for years.

"A call to New York or San Francisco pays 5 cents war tax, the same as a 15-cent call. Is there any justice in such a schedule?

"Why not have a percentage tax on long distance? Personally I have nearly 100 long distance calls a month. My bills run about $35 to as high as $125 a month, most of the calls being on the short schedules. This new ruling of 5 cents on each call will raise my rates nearly 30 per cent on an average. When I telephone to Chicago or New Orleans, as occasionally I do, I gladly would pay more than I do when I telephone out in the country a few miles, and I should.

"Why not tax the corner drug stores, where nearly all the pay business is not for business? Why allow such drug stores to make a penny or two on calls that in most of the cases are simply appointment and not actual business calls? How many business calls are made from drug store or hotel booths, and yet those calls are free of taxation on the person telephoning? He or she drops in a nickel, the telephone compaany gets 3 cents, the proprietor of the store 2 cents, the government 5 per cent.

It seems to me that if the young fellow wants to call his girl on the telephone, he should pay a little of this war tax and not put it all on business."

Employes Advised to Stick

Telephone employes have been advised by the government, through Brigadier-General George O. Squier, chief signal officer of the army, that they can serve the country "in no better way than by sticking to their posts."

In a letter sent by him to Vice-President MacKinnon of the United States Independent Telephone Association and to the heads of the various Bell companies, General Squier says:

"In the conduct of the war that is upon us the service furnished by your company and by all telephone companies will be of the greatest importance.

"You will be called upon to meet demands of the most urgent kind; you have been called upon, and you may be called upon further, to provide men trained in the art of constructing and maintaining telephone and telegraph lines. I, therefore, direct your attention to the fact that men and women now engaged in providing this all important service can serve their country in no better way than by sticking to their posts."

Commenting upon this letter, Mr. Bethell of the Eastern Bell group, said that telephone workers are fully awake to the importance of telephone service at the present time and are bending every effort to serve the country by providing fast, effective service both for the use of the government and for the country's commercial interests.

"For more than two years we have been called upon to handle an unprecedented amount of telephone traffic, due principally to the expansion of American trade activities as a result of the war. This demand was immediately increased by our entry into the world conflict. In handling this rising tide of telephone traffic we have made use of our reserve plant, invented substitutes for raw materials shut off by the war and trained thousands of new employes.

"We are confident that with the continued co-operation of the public, manifested by exercising care and consideration in the use of the telephone, we shall continue to provide the quality of telephone service required in this emergency."

Indiana Convention Date Set

Secretary Frank E. Bohn of the Indiana Independent Telephone Association announces that the next annual convention of the association will be held September 19 and 20, 1917, at Indianapolis, in the Claypool hotel. In connection with the convention an operators' school will be held in charge of W. S. Vivian and F. V. Newman. This early announcement will give manufacturers and jobbers opportunity to prepare for a good display. Further announcements will be made later.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

Records on Kellogg Switchboard

Skill in any line of endeavor draws the attention of the world, but personal effort—that is, the deftness of brain and muscle—invariably commands the greatest consideration and enthusiasm.

The wonder of the trained athlete, or the apparent superhuman skill of the champion typist, commands greater applause than the most wonderful man-made machine. The co-operation of Manager E. G. Miller of the Warren & Niles Telephone Company and his operators in giving the promptest and most efficient service possible, as shown by their peg count records, is much to be admired.

Miss Mae Grubbs.

In the sample sheet taken on May 29, which is reproduced on this page, are some statistics of calls answered that are scarcely believable, evincing skill and attention to work which places these operators, indeed, in the champion class.

Here, for instance, in one hour, with eight operators, five of them handled over 422 calls each; one of them totaling 521 and another 712. This latter operator, Miss Mae Grubbs, holds the prize for skill at the Kellogg instantaneous recall switchboard, which is said to be in a class by itself in the giving of efficient service.

Brain and muscle must co-operate when nimble fingers pile up such a "score."

Automatics for Ohio Farmers

Many residents of the rural districts surrounding the city of Elyria, Ohio, are rejoicing over the announcement of the Elyria Telephone Company, to the effect that all farm telephones are to be equipped with automatic installations the same as those of subscribers in Elyria.

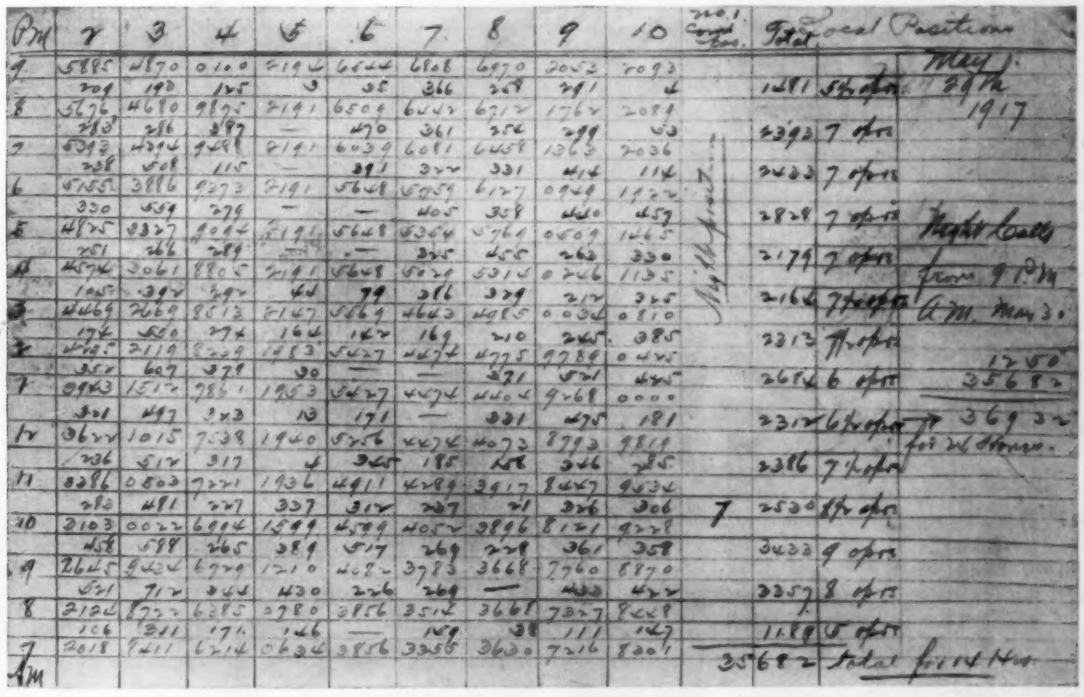
This fact is especially noteworthy when it is pointed out that this will be a rare instance where such an arrangement is introduced. Even in the large centers where the automatic system has been installed for a considerable length of time, rural lines usually continue to be operated on the manual system.

The service Elyria will enjoy when the present system is cut over to automatic next March will be the last word in telephone efficiency.

Stromberg-Carlson New Generator

The accompanying illustration shows the design and appearance of a new switchboard generator manufactured by the Stromberg-Carlson Telephone Manufacturing Company of Rochester, N. Y., for use in rural switchboards which terminate long and heavily loaded lines subject to unusually severe ringing conditions.

Tests made in the company's laboratory and based upon current output and also upon the actual number of bells operated satisfactorily shows that this type of switchboard generator is capable of delivering an output at least 38 per cent greater than any other five-bar type

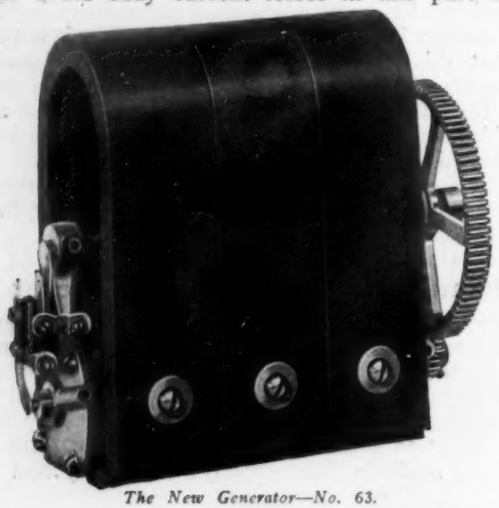


The Above Peg Count Shows the Possibilities of Kellogg Switchboards.

hand generator—including the Stromberg-Carlson Company's own make.

The high efficiency and large output of this generator is largely due to the intensity of the magnetic field in which the armature revolves. This field is established and maintained by three large size permanent magnets similar to those used in automobiles for ignition purposes. The steel from which the magnets are made is a special alloy which possesses exceptionally fine magnetic qualities and retentivity so that the generator shows no appreciable loss of power throughout its useful life.

The armature core, as in other types of Stromberg-Carlson hand generators is built up of laminated stampings to avoid eddy current losses in this part of the



The New Generator—No. 63.

apparatus. The armature is wound with silk insulated copper wire and is impregnated with a moisture proof insulating compound after winding to prevent breakdowns in service due to excessive moisture in the coils.

This new generator is now known as "No. 63" and may be used in all makes of switchboards with equal success. It is interchangeable in Stromberg-Carlson switchboards with the generators now in use as it mounts upon the same cabinet drillings.

Further information regarding this generator will be supplied upon request by any Stromberg-Carlson salesman or by any of the company's offices.

Kellogg Board at Park Falls

Installation of the new 1,200-line Kellogg universal switchboard is progressing at Park Falls, Wis.

The Glidden Telephone Company, after a comprehensive and careful investigation of switchboards, decided in favor of the Kellogg universal on grounds of efficiency and economy, and accordingly placed its order with the Kellogg Company for a handsome three-position switchboard.

This board, with its universal cord circuits, combines the advantage of common battery with magneto service. Subscribers can be changed from magneto to common battery telephones one at a time, or as desired.

This is a lamp signal board possessing all of the advantages of the Kellogg standard common battery sections.

The illustration shows a board very similar to that which is being installed in Park Falls.

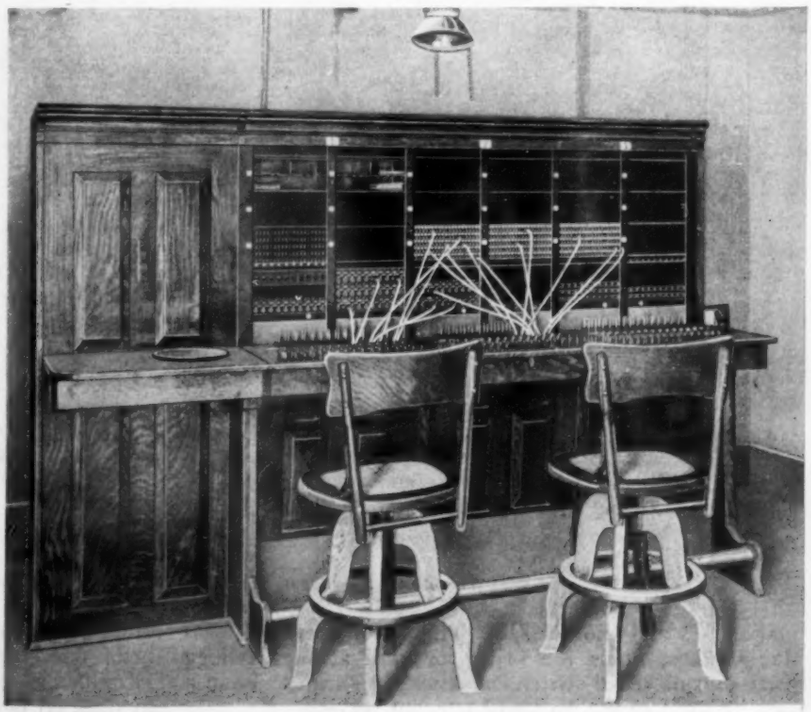
Standard Telephone Repair Moves

Number 321 North Crawford avenue, Chicago, is the new address of the Standard Telephone Repair Company. The company was formerly located at 208 North 5th Avenue, where it occupied 1,000 square feet of floor space. The new quarters provide 8,000 square feet. Considering the fact that the company was started by

The New Plant of the Standard Telephone Repair Company

Mr. J. Skinderviken only a little over ten months ago, this growth is quite remarkable.

The company is enlarging its equipment by putting in the most modern machinery, and will more than double its present force. Mr. Skinderviken states that he aims to secure only the best equipment.



Kellogg Universal Switchboard.

Working a Wire Under Fire

A letter from an English officer is quoted in the *London Times History of the War:*

"I am very much surprised to see in the English press so little mention made of the field telegraph or signal service, as it is now known. In time of war the signal companies of the Royal Engineers are among the most important and necessary arms of the service. They are the nerves of the army.

"Most of the important towns in the north of France and also London and Paris are in direct touch with general headquarters. They are called the main lines of communication, and over their lines day and night pass a continuous flood of traffic for the hospital bases, ordnance, remount, and store depots. From general headquarters radiate wires to the various army corps headquarters, and, again, each army has its communication to the divisions, which, further, have wires right up to the brigades. It will thus be seen that in the space of a few minutes the war office is fully and clearly informed of what is going on in the firing line. In fact, were the lines joined straight through it would be possible to hear the roar of artillery and the bursting of shrapnel in Martin's-le-Grand.

"As the tide of battle turns this way or the other and headquarters are constantly moving, some means have to be provided to keep in constant touch with general headquarters during the movement. This emergency is met by cable detachments. Each detachment consists of two cable wagons, which usually work in conjunction with one another, one section laying the line whilst the other remains behind to reel up when the line is finished with.

"A division is ordered to move quickly to a more tactical position. The end of the cable is connected with the permanent line, which communicates to army headquarters, and the cable detachment moves off at a trot; across country, along roads, through villages, and past columns of troops, the white and blue badge of the signal service clears the way. Behind the wagon rides a horseman, who deftly lays the cable in the ditches and hedges out of danger from heavy transports and the feet of tramping infantry with the aid of a crooked stick. Other horsemen are in the rear tying back and making the lines safe. On the box of the wagon sits a telegrapher, who is constantly in touch with headquarters as the cable runs swiftly out. An orderly dashes up with an important message; the wagon is stopped, the message dispatched, and on they go again. So it matters not whether we are in permanent or temporary quarters or even if we are in the act of moving our camp from one location to another, we are at all times ready to receive or send a message.

"At Le Gateau the situation was so desperate that signal companies were sent to the trenches to assist the infantry in repelling a heavy attack. For this piece of work we were highly complimented by Gen. Smith-Dorien, who at the same time expressed his great satisfaction at the way in which his communications had been established throughout the campaign.

"Telegraphers are often left on duty in the trenches and lonely farmhouses, chateaux, etc., close to the firing line, and I leave it to your imagination to picture how difficult it is to concentrate one's mind on the signaling and reception of important messages while the air is filled with the deafening roar of artillery and the screaming and bursting of shells.

"An experience of this kind happened to me a short time ago in a lonely chateau on the Ypres-Menin road. The chateau was the center of a perfect hell of German shrapnel for nearly a week, until it became almost untenable, and was abandoned by the headquarters' staff. The general gave instructions that a telegrapher was to remain behind to transmit important messages from the brigades, and I was left in charge of the instruments in this shell-swept chateau for a day and a night.

"On the second day the Germans broke through our trenches, and wires were cut by the shell fire. I was given orders to evacuate the building and smash up my instruments. These I saved by burying in a shell-proof trench, and then I had to escape between our own fire and that of the enemy's across a field under a terrible tornado of shrapnel. On the early morning of the same day one of our cable detachments was cut up and another captured by the Germans, only to be retaken by our sappers and drivers after a desperate and glorious fight.

"In the region of the Aisne, where the hilly and wooded nature of the country admitted of much cover, spies often took advantage of this to tap our wires. The lines are constantly patrolled by mounted linemen, whose duty is attended with much risk. On one occasion a lineman in passing along his patrol noticed that there was a quantity of slack cable lying on the side of the road. Dismounting to coil it up out of the reach of traffic he found to his surprise that a piece of spare wire had been tied into the main line, and upon investigating discovered that it led to the top of a haystack, the wire being cunningly hidden in the straw. Going farther down the line he tapped it and reported the matter to headquarters, then mounting guard over the haystack he waited the arrival of an armed escort, who discovered the spy, together with several days supply of food, hidden in the depths of the hay.

"Wireless telegraphy, of course, plays an important part in this war, most of the larger aeroplanes being equipped with apparatus, by which means they swiftly communicate important observations to headquarters. The Germans also make elaborate use of this system."

Reasons for Rate Raise

The Belvidere (Ill.) Telephone Company has caused to be published the following statement under date of August 15:

"You will perhaps notice in this issue of the *Daily Republican* an application to the Utilities Commission for an increase in telephone rates. It has always been the policy of this company to keep the rates as low as possible but owing to the great increase in both labor and material it becomes a necessity that the present rates be readjusted and advanced. When the present rates were promulgated about five years ago, they were based on the prices of labor and material at that time. Since that time both labor and material have advanced from 25 per cent to 300 per cent. A comparison of prices then and now on some of the main costs of operating will verify this statement and may be interesting to you.

	Costs Then	Costs Now
Experienced operators	$ 22.50	$ 35.00
Experienced linemen	60.00	80.00
Experienced linemen	60.00	80.00
Steel wire per M. lbs	37.50	82.50
Copper wire per M. lbs	140.00	400.00
Cable, per M. ft	110.00	300.00

And other material in about the same proportion.

"You can readily see by the foregoing that stern necessity compels us to take this action."

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES

Arthur Kneisel, National Treasurer for the American Association of Engineers, died in Chicago on August 17, 1917. He was one of the original promoters of the association and was secretary up to this year. As a writer of technical articles, he always stood for the principal of "elevating the engineering profession and receiving recognition for the engineer." He was co-author, with G. W. Cummings, of the series entitled "Telephone Talks," which ran in TELEPHONE ENGINEER from January, 1915, to May, 1916. Mr. Kneisel was born in Lexington, Ky., in 1880, and received his early education in the Lexington schools, later graduating from the

University of Kentucky. He came to Chicago over 15 years ago and was engaged as a telephone engineer and patent attorney for a number of well-known companies. At the time of his death, he was president of the Utilities Development & Sales Company. Mr. Kneisel made a host of real friends in the telephone trade, and his untimely and unexpected death was a shock to all of them.

E. R. McFarland, formerly of Toboso, Ohio, who is now superintendent of telegraph and telephone for the Alaskan Engineering Commission, which is building a railroad in Alaska, has been commissioned a captain in the Signal Officers' Reserve Corps, and has been ordered to Seattle from Anchorage, Alaska, for orders. Captain McFarland was a member of Company G, of the Seventh O. V. I., when that company left Newark in 1898, during the Spanish war. He later transferred to the signal corps, and has spent several years in Alaska constructing telegraph and telephone lines for the government. He first entered the regular army in the '80s, and was in the Dakotas at the time of the last Sioux war in 1889-90.

Manager Dwight P. Bone of the Bell Telephone Company of Elmira, N. Y., has been transferred to the managership of the Utica office. His place will be taken by George J. Taylor, chief clerk of the commercial department. L. H. Terrill of Corning will be the new chief clerk.

L. A. Herrick, formerly manager of the Stephenson County Telephone Exchange, of Freeport, Illinois, has purchased the telephone exchange and property at Mineral Point, Wisconsin. Mr. Herrick took possession of the property on August first. Several other investors are interested with him in the business but the greater amount of the stock is held by Mr. Herrick, who will have direct charge of the entire business. He holds about seventy-five per cent of the stock. Immediately after taking over the business the former manager of the Stephenson County Exchange began reorganizing the company and making such changes as were deemed necessary. The exchange at Mineral Point is about equal in size to that of the Stephenson County Exchange when Mr. Herrick took hold of the latter several years ago. The exchange, which he recently purchased, has been doing a good business and Mr. Herrick and the men who are associated with him feel that they have made an exceptionally good investment.

Earl Bruner, lineman for the Morocco Telephone Company, of Indiana, has purchased the Baroda telephone plant owned by A. L. Clark. Mr. Bruner is a good telephone man and will no doubt make an excellent thing of the new purchase as he has a fine territory to draw from. He will move to Baroda and take charge of the plant as soon as another lineman can be secured by the local company.

Angus S. Hibbard, a director of the Chicago Telephone Company, was elected chairman of the Chicago Day committee. It was decided to hold public meetings in Grant park and Orchestra hall, at which prominent speakers will deliver addresses and moving pictures concerning fire and accident prevention will be shown. Gov. Lowden will be invited to address the Orchestra hall meeting. The date has been set for October 9.

Clifford C. Morris, formerly connected with the commercial department of the Ohio State Telephone Company, was killed when he was run down by an automobile in St. Paul, Minn.

Morris, who left Columbus two months ago, was leaving the hospital where his wife had given birth to a daughter, when he was struck by a speeding automobile. He died in the room directly under that occupied in the hospital by his wife. His skull had been fractured.

Nels Williarson, local manager of the telephone exchange, at Neenah, Wisc., has worked for the telephone company twenty years. Mr. Williarson came to this city some twenty-four years ago and entered the employment of the telephone company, in three years he worked himself into the managerial chair, which position he has occupied since.

John Francis Casey, 51 years old, traffic manager for the Kinloch Telephone Company of St. Louis, Mo., and holder of many telephone patents, died at Barnes Hospital after a two weeks' illness. Kidney trouble and complications were given as the cause of his death. Casey had a national reputation as a technical telephone authority, and from the time the telephone became a commercial institution gave it his constant study. Casey, who was born in St. Johns, Canada, was brought to St. Louis by his widowed mother when he was a small boy. A few years later he became a messenger boy for the American District Telegraph Company, the manager of which was George F. Durant. When the Bell Telephone Company of St. Louis was organized Durant was elected president and Casey went to the new concern with Durant. There were few technical telephone men at that time. In a few months Casey knew about all there was to know about the early telephone, and within the next few years devised many improvements, a few of which still are in use. Thirteen years ago Casey went to Pittsburgh to install new switchboards and reorganize the subsidiary branch of the Bell there. Three years after he returned to St. Louis as traffic manager of the Kinloch, which position he held to his death. Casey is survived by his sister, Miss Julia Casey, a niece, Mrs. W. G. Meiser, and a nephew, R. L. Casey. George Mockler, publicity agent for the Terminal Railroad, is his cousin.

H. R. Pope, for six years manager in Franklin, Pa., for the Petroleum Telephone Co., of Oil City, Pa., has resigned from that position to enter business for himself along the line of electrical contracting business in all its details. Entering telephone service at the age of 10 as office boy, he has held all positions to that of manager. Mr. Pope's efficiency and unfailing courtesy are reflected in the growth of the Petroleum company in Franklin, a gain of more than 700 telephones being made in the six years he has acted as manager.

R. T. Pierson, formerly a member of the Stromberg-Carlson Telephone Manufacturing Company's Rochester sales department, has been appointed a first lieutenant in the U. S. Signal Corps Reserve and is now taking up the officers' training course at the Signal Corps Training Camp at Monmouth Park, N. J. Lieutenant Pierson's wide experience in telephone engineering work in both the operating and manufacturing branches of the industry should lend weight to his efforts when the time arrives for the great drive of the "Amexes" in France. We wish him good fortune, a full measure of the honors and a safe return.

Oscar L. Plumpton who has been resident manager of the Bayfield County Telephone Company of Wisconsin the past two years resigned his position with that company the first of the month and will in the future devote all his attention to the hotel business. He has been conducting the Bayview hotel for sometime past and under his management this popular hostelry is enpoying a large patronage.

H. R. Gieselman has been elected president of the Renville Telephone Company of North Dakota, Val Bott, vice-president, and S. Terhorst, secretary-treasurer. The company has engaged as general manager, A. F. Chisty of Berthold, N. D.

G. C. Ward has been appointed manager

of the Iowa Telephone Company in Dubuque. He succeeds W. G. Hathaway, who was recently made a second lieutenant in a machine gun company of the Iowa guard and who is now in the service at Davenport. Mr. Ward has been manager of the Iowa Telephone Company at Colfax, Ia., for the past three years. At the time of his appointment as manager of the Dubuque office he was enjoying a vacation in Minnesota. He has been installed at his new post by Clarence E. Campbell, a former manager of the Dubuque office but who is now a district manager.

Joseph Lees, of Saginaw, Michigan, is to be the new superintendent of the Moore Telephone System. Mr. Lees was formerly manager of the Valley Telephone Company and his many friends will be glad to hear he is coming back to Caro.

H. J. Shavely, formerly with the Central District Telephone Company at Wheeling, West Virginia, has been made manager of the Logan division of Chesapeake & Potomac Telephone Company.

Hurh Erlon, of Peoria, Illinois, has been appointed manager of the Central Union Telephone system at Pekin, and will move there soon with his family.

According to the Rock Island, Illinois, papers A. J. Beverlin, formerly connected with the Bell Telephone Company in the Maple City, has resigned his position in Rock Island and has accepted a position with the Stephenson County Telephone Company. The headquarters of Mr. Beverlin will be in Freeport, Illinois. Since 1904 Mr. Beverlin has been manager of the Rock Island District for the Bell Telephone Company.

Ben F. Early, for several years until recently when he resigned, the manager of the Central Union Telephone Company at Shelbyville, Indiana, and widely known here from the fact that the local branch of the company was under his jurisdiction, has become the manager of the Alhambra picture theater in Shelbyville.

F. E. Schrepel of Cache Valley, Utah, is in Rock Springs, Wyoming, to accept the management of the local telephone exchange. Harry Morgan, who has been manager there for the past three years, will be promoted to the exchange at Logan, Utah. Mr. Morgan came here in September, 1914, and since that time has succeeded in having many improvements made in the Rock Springs exchange. During his term as manager the Rock Springs exchange has almost doubled in number of telephones in use, and the service has been vastly improved. The people of Rock Springs are exceedingly sorry to see Mr. Morgan and his family leave the city, and they wish them success in their new location.

Local manager of the Texas Telephone Company at Temple is appointed lieutenant of U. S. Signal Corps.

NEWS FROM THE FIELD

DISTRICT OF COLUMBIA

According to the company a new exchange, to be called the Franklin, will be opened in Washington about September 1. Some of the lines now connected with the Lincoln exchange will be transferred to the new office. "In addition to the relief afforded by these transfers," states the company, "we schedule to install three new switchboard divisions, in the Lincoln office in September and six more divisions in October. The switchboard now used in the Lincoln office is non-multiple, which necessitates the trunking of many calls to be completed in the Lincoln office to other positions in that office. In September the Lincoln switchboard will be changed to a multiple switchboard. The change from non-multiple to multiple will materially decrease the number of calls in error, many of which errors are at present made when trunking calls from one operator to another in the Lincoln office."

FLORIDA

C. F. Geiss, assistant supervisor of the United States Coast Guard Telephone Line Construction, Thomas F. Starr and G. W. Smith, inspectors, are now busy preparing apparatus and other necessary paraphernalia for laying a telephone cable across the Indian river from the Coast Guard Station to Fort Pierce, thus giving quick connection from the house of refuge to the outside world. This is a much-needed move. It gives the guard access to help in emergencies, quick touch with the men higher up in case of sighting submarines or other fighting craft, and the hundred and one other needs for quick communication, besides keeping the boys a little closer in touch with home and friends.

GEORGIA

The Hemlock telephone exchange, the sixth unit of the Southern Bell Telephone Company system in Atlanta, which is located at Crescent avenue and Tenth street, has become a part of the city's extensive telephone equipment, according to announcement made by officials of the company. The new exchange will carry 2,100 numbers at first, although it has a much greater maximum capacity. The building which will house the exchange has been in course of erection for some time past. It has only been recently completed and it is one of the handsomest in the entire city. The entire exchange equipment, together with the building, cost the telephone company more than $250,000.

IDAHO

Mountain States Telephone Company will spend $30,000 on Montpelier-Cokeville line.

ILLINOIS

The Macoupin County Telephone Company of Carlinville, is now located in its new building, which is a duplicate of the one destroyed by fire last February.

The Menard Telephone & Telegraph Company of Greenview has increased its capital stock from $10,000 to $25,000.

The Niantic Telephone Company of Niantic has increased its capital stock from $1,000 to $12,000.

INDIANA

Permission has been granted the Indianapolis Telephone Company by the Indiana public service commission to issue $1,000,000 6 per cent five year notes. The notes cannot be sold under 95 and the proceeds are to be used for betterments and buying new properties.

KANSAS

The Northeast Kansas Telephone Company has begun running a telephone line to the Grain Belt Alfalfa Mill, in Elwood bottom. The new sidetrack to the mill is nearly finished and work has begun on an office building.

The United Telephone Company of Clay Center has purchased the Josephine Patterson lots on the corner west of the postoffice and will commence the erection of a telephone building at once. The building will consist of a basement and two stories.

KENTUCKY

Manager A. J. Miller, of the local office of the Cumberland Telephone & Telegraph Company, announced that new circuits between Winchester and Richmond had been completed, and that a force of men were now engaged in the construction of an additional circuit between Richmond. Owing to the ruggedness of the territory, the local company does not maintain a line between Winchester and Irvine direct, and it is necessary for Winchester to get into communication with that town by the way of Richmond. The facilities which have been employed heretofore were inadequate. When the additional circuit between Richmond and Irvine is constructed, it will be very little difficulty for Winchester to get into communication with Irvine within a very short time.

MARYLAND

The C. & P. Telephone Company completed the work of moving their pole line from Easton to St. Michaels to one side of the road, according to an agreement with the St. Michaels Utilities Commission. While this change was being made the company took advantage of the opportunity to string a new copper wire direct from Easton to Tilghman.

The annual meeting of the Auxvasse Mutual Telephone Company, which was held at the Auxvasse Bank, was well attended, considering the number of threshing machines operating among the shareholders. During the year just closed the Younger trunk line was rebuilt, while improvements and extensions were planned at the meeting. As to whether the improvements will be made will depend somewhat on what some of the neighboring mutuals think of the proposition. Regarding the matter of Buffum and other long distance connections with the Auxvasse mutual, ordered last year by the Missouri Public Service Commission, the Buffum company contested the authority of the commission in the Cole County Circuit Court and was upheld there. The case has been appealed to the supreme court and disposed of at the Otcober term.

MASSACHUSETTS

The directors of the New England Telephone and Telegraph Company have voted to increase the capital stock of the company by $11,000,000, offering to stockholders of record on Aug. 28 the right to subscribe at par for one share of new stock for each five shares of existing stock held on that date.

MICHIGAN

Plans for an expenditure of $150,000 for telephone toll cables running out of Detroit have just been approved by the president of the Michigan State Telephone Company, and the improvements will greatly facilitate the long distance telephone business between Detroit and points north and west of there, including Bay City and points tributary to this office.

Election of officers of the Rosy Mound Telephone Company was held and F. F. Groth was elected president and Herman Smith was named secretary. The company now has fifteen subscribers with prospects of further growth.

Buchanan is to have a building erected especially for telephone purposes and an exchange second to none in the state, so say officers of the Michigan Bell Telephone Company. The officers state that the new building will be a model of beauty and convenience and will cost approximately $10,000. Other improvements will run up several thousands more.

At the present time there are 779 subscribers receiving service through the Buchanan exchange and over 50 have made application for service and cannot be ac-

commodated. The switchboards are filled to capacity and the business has long since outgrown its present quarters. It is a case of forced expansion due to Buchanan's rapid growth.

MINNESOTA

A permit was issued to the Northwestern Telephone Exchange Company to build a $74,000 brick and concrete garage and warehouse at 540-590 Vandalia street, St. Paul.

MONTANA

The Helena national forest is to build a telephone line from Townsend east, 14 miles up Deep Creek, to the Deep Creek ranger station, according to Supervisor J. B. Seely. There is an old line to the station, but it is not satisfactory. The new line should be installed before the summer is over. There is now only one regular ranger station in the Helena forest that has no telephone connection. That is the station up Duck Creek, eight miles northeast of Canton, Broadwater county, where the nearest telephone is five miles distant from the ranger's home. The annual report of the Helena forest shows that 16 miles of telephone lines were constructed by the forest in the fiscal year ending June 30, 1917, making a total of 144.8 miles in the entire forest. The value of these telephone facilities is fixed at $7,106.

NEBRASKA

The Nebraska & Wyoming Telephone Company is making some great improvements in lines and equipments at the present time. A gang of fourteen men are thoroughly rebuilding the company's line between Whitney and Crawford, setting new poles and stringing new copper wires. The work has been completed from this point to Whitney, and the crew is now on the last stretch. Four carloads of copper wire has already been used in modernizing the company's lines in this territory, and one more car will be required, provided it can be secured.

OHIO

Three new exchanges will be opened in Toledo September 1 by the Ohio State Telephone Company. They cost $250,000 and will serve between 5,000 and 6,000 subscribers. One, at Orchard and Thayer streets, will be known as the Walbridge exchange; another, at Palmer and Detroit will be the Prospect exchange, and the third in the north end will be Edgewater, for bay shore cottagers. The company also recently has spent $100,000 to relieve the wire traffic in West Toledo. Manager George Ford says 70 additional operators will be employed.

The Elyria Telephone Company has begun to dismantle its present quarters on Second street in order to erect a modern telephone exchange in the present site. The company will establish temporary office headquarters in the Sampsell building, directly across the street.

OKLAHOMA

The work of remodeling the plant of the Pioneer Telephone Company is well under way and officials of the company announced that they are confident the two exchanges "Osage" and "Cedar" will be inaugurated early this fall as originally planned.

PENNSYLVANIA

The Chesapeake & Potomac Telephone Company has broken ground in Elkton for a new exchange building which will cost about $75,000.

The old board of directors of the People's Telephone Company was reelected at the annual meeting of the stockholders held at the offices of the company on West Jefferson street. The reports of the officers showed that the company had a successful year's business and added materially to the extent of its plant and the territory covered by its service. The following board of directors was re-elected: Daniel Younkins, J. Henry Troutman, T. M. Baker, H. W. F. Graham, T. J. Shufflin.

SOUTH DAKOTA

The topic of conversation at a meeting of the local managers of the Nebraska Telephone Company of the Deadwood district held at Deadwood was the conservation policy now in effect, made necessary from the heavy drain of materials and equipment required in furnishing the government in its present need with immediate service at its different training stations, camps and forts throughout the United States and the inability of manufacturers to furnish this equipment due to the shortage of raw materials. The managers in attendance were L. E. Coffin, Hill City; Fred W. Webster, Sturgis; M. J. Vernon, Rapid City; A. M. Lanstrup, Belle Fourche; Jas. R. Marshall, Deadwood and Lead, and O. M. Taylor, O. W. Johnson and Fred Suray were in attendance from the plant department.

TEXAS

Twenty-seven miles of new telephone line has been recently constructed in the eastern part of the county by the El Paso County Mutual Telephone Company, making a total of 61 miles of main line and 108 miles of lateral line connecting outlying ranches and towns with the Bell system. In a meeting of company officials with farmers and ranchers from the eastern part of the county, 100 farmers and residents in the vicinity of Truckton pledged themselves to support the movement and become subscribers. Immediately the company announced that a new central would be established at Truckton. A total of 180 subscribers have been obtained and an effort will be made to interest other farmers in eastern El Paso county.

The city has purchased a third interest in a telephone line from Rosen Heights of Forth Worth to the west end of the Nine-Mile bridge at Lake Worth, according to City Secretary H. E. Lawerence.

Permission has been granted by the county commissioners to the United States government for the construction of a telephone line from Fort Sam Houston in a northwesterly direction to the San Antonio & Arkansas Pass right-of-way, along which it will be extended to the military reservation at Leon Springs. Permission also has been granted J. O. Terrell to build a telephone line along the Bandera road to the Terrell ranch.

UTAH

At a recent meeting of the board of county commissioners, the Western Co-op. Store of Park Valley was granted a franchise to construct and operate a telephone system in western Box Elder county.

INCORPORATIONS

The Celeste Telephone Company of Texas has been incorporated with $15,000 capital. The incorporators are W. E. Nealy, J. W. Ewing and A. W. Ewing.

The Huntington Telephone Company of Texas has secured a state charter. It starts out with $4,000 capital stock and the incorporators are R. P. McKewen, W. T. Stewart, J. W. Buckner and C. D. Stewart.

The City Telephone Company of Sunnyside, Wash., has been incorporated with $15,000 capital stock by F. J. Taylor, Austin Woodyard, A. M. Harfin and E. F. Keyes.

The Wauconda Telephone Company of Washington has been incorporated with $5,000 capital stock by Joseph A. Merva and others.

Metropolitan Telephone & Telegraph Company, Springfield, Illinois; capital, $5,000; incorporators, H. Lee Sellers, James Dalton, John Syvert.

Goldstone, Rudyard, Brinkman Rural Telephone Company of Rudyard, Hill county, Montana. Incorporators, E. Koefod, J. V. Stevens, Ole Sanda and others of Rudyard. Capital, $40,000; $1,000 subscribed.

The South Atlantic Telephone & Telegraph Company, of Miami, Fla., has been incorporated with $1,000 capital stock. Its officers and directors are as follows: Julius Smith, president; H. Thompson Whaler, vice-president; J. L. Perkins, secretary, and R. Earl Smith, treasurer.

Articles of incorporation of the Cameron Short Line Telephone Company of Idaho were filed with the county recorder recently, naming George Ehlers, August F. Wegner, A. F. Rucks, John Schwartz and A. O. Wegner as directors. The line constructed will be 15 miles in length from Kendrick via Cameron to Leland.

The Yankee Hollow Telephone Company of Willow Junction, Iowa, has incorporated for the construction and operation of rural telephones. The capital stock of the corporation is $420, divided into shares of $30 each. The officers and board of directors are as follows: Robert Harder, president; B. L. Horton, vice-president; G. W. Klein, secretary and treasurer; O. B. Collier, D. B. Collier, Bartholoma Bros., C. E. Covell, J. Nolte, Fred Boot, Floyd Barclay, Mrs. C. Harder and John Mohr, Christ Jasperson and W. J. Jasperson.

The Ensign Telephone Company of Kansas has been incorporated with a capital stock of $10,000.

The Lazy Creek Telephone Company of Hazel Green, Kentucky, has incorporated with a capital stock of $225. The incorporators are: Frank Sample, Green Trimble and S. S. Rose.

Articles of incorporation have been filed by the La Rue Home Telephone Company of Hodgenville, Kentucky, with $7,500 capital stock. The incorporators are T. B. Kirkpatrick, C. J. Hubbard and George E. Kelly.

The Grant City Telephone Company of Missouri, with a capital stock of $4,000, has been chartered by John Andrews, J. J. Baker, J. F. Cloud and others.

Articles of incorporation of the Gage Telephone Company of Montana have been filed with the county clerk and recorder. The company is capitalized at $15,000 and the officers are J. M. Batchelet, president; B. M. Pierce, vice-president; C. F. Crothers, secretary, and E. Parker, treasurer, all residents of Gage.

The Retah Telephone Company of Montana has been incorporated with $30,000 capital stock, of which $2,700 has already been subscribed.

The Amos Creek Telephone Company of Obert, Nebraska, has filed articles of incorporation in Dixon and Cedar counties and is capitalized at $5,000. Following are the officers: A. C. Anderson, president; C. J. Provancha, vice-president, and K. P. Jensen, secretary and treasurer.

The Gibsonburg Telephone Company of Ohio has been incorporated with $75,000 capital stock by A. H. Miller, N. B. Ervin, C. B. Snyder, W. J. Mead, F. W. Zorn, G. W. Hornung and F. C. Hornung.